WORKING PLAN

FOR THE

TINNEVELLY *CUM* RAMNAD FOREST DIVISION

1934–35 TO 1943–44

BY

E. A. LASRADO, Esq., M.A., I.F.S.
Deputy Conservator of Forests and Working Plans Officer

UNDER THE DIRECTION OF

C. C. WILSON, Esq., I.F.S.
Conservator of Forests, Working Plans Circle

MADRAS
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS

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WORKING PLAN FOR THE TINNEVELLY CUM RAMNAD DIVISION.

PART I.

Summary of facts on which proposals are based.

CHAPTER I.—GENERAL DESCRIPTION.

SECTION 1.—NAME, SITUATION AND OWNERSHIP.

1. *General.*—The Working Plan covers all the Reserved Forests of the Tinnevelly *cum* Ramnad Forest Division, which well be referred to hereafter as " the division," in order to distinguish it from the two revenue districts of Tinnevelly and Ramnad. It covers an area of 258,997·67 or 404·68 square miles.

2. *Position.*—The division is situated between 8° 21′ 20″ and 9° 38′ 20″ North Latitude, and 77° 12′ 42″ and 78° 5′ 21″ Longitude East of Greenwich.

SECTION 2.—PHYSICAL DESCRIPTION.

3. *General.*—The bulk of the forest is situated on the eastern water-shed of the Travancore extension of the great irregular chain of the Western Ghats which in this division attain comparative regularity. Save for a break near the Shencottah gap, they march southward in an unbroken line from the northern limit of the Tinnevelly District as far as the Tambaraparni valley; thence sweeping for 12 miles in a bold curve towards the South-East, they once more resume their southward trend to the sea.

4. *Chief peaks.*—Along the skyline the mountains average approximately 5,000 feet, more than a score of peaks exceeding this height; conspicuous among these are Kottaimalai 6,624 feet and Vellimalai 6,154 feet both at the trijunction of the Tinnevelly, Ramnad and Madura districts, the Kallakadai mottai 5,721 feet above Sivagiri, and Kuliratti 5,876 feet towering up behind Krishnapuram; southward from this point the hills decrease in height, the main range dropping rapidly to the Achenkoil and Ariankavu passes. Recovering again, they climb rather abruptly and culminate in the splendid peak of Panjantangi 5,135 feet above Kuttalam and the General's Hill 4,439 feet on the border of the Tenkasi and Ambasamudram taluks. Here the ghats begin to widen out, and above Papanasam the range attains its maximum thickness of 13½ miles. The country falls to the plains from the great range of high rugged mountains which mark the water-shed, in a series of precipitous slopes, with a variety of aspects, intersected by numerous rivers and streams. Interspersed are undulating plateaux of comparatively small extent, such as the Mundanthorai plateau in Ambasamudram Range. The most striking of this mass of mountains is Agastyamalai 6,125 feet, the fabled abode of the famous *rishi* Agastya, unfortunately ceded to Travancore in 1928. A perfect cone in shape, standing on a low base in a wide gap of the skyline, it is a magnificent sight when seen from the plains. Adjacent to it is the Ainthalai Pothigai in Singampatti Zamin. This peak marks the turn of the water-shed to the South-East as far as the Nanguneri frontier. The hills in Nanguneri range lose in width and are more precipitous. Above Tirukurangudi they tower up to 6,000 feet, dropping at the Nadugani gap to 3,000 feet only to rise again to the Mahendragiri range 5,427 feet which ends abruptly in a magnificent scarp of bare precipitous rock known as Tiruvanamalai 4,610 feet.

5. *Zamindari forests.*—A number of Zamindari forests dovetail with the Government forests along the ghats. The principal among these are the Singampatti Zamin in Ambasamudram taluk, the Vairavankulam Zamin in Tenkasi taluk, and the Sivagiri Zamin in Sankarankoil taluk. This factor complicates the efficient management of the Government forests enormously, as irregular working of the Zamin forests tends to produce wide fluctuations in the prices obtainable for forest produce in the adjacent Government reserves. Besides, the lack of silvicultural and other restrictions in the working of Zamin forests, tends to attract contractors away from work in the Government forests.

6. *Plain forests.*—A prominent feature of the Tinnevelly-Ramnad plains is the numerous isolated hillocks which tend to break the monotony of an otherwise depressing landscape. Of these a few have been constituted reserves, with the object of ensuring the supply of fuel and grazing to the surrounding village communities. The Vallanad reserve

in Srivaikuntam Taluk, the Kolundamamalai and Manpottai reserves in Ambasamudram taluk, and the Valaikulam and Sappaniparambu reserves in Srivilliputtur Taluk are examples of such reserves.

7. *Sand dunes.*—The Kudiraimozhi Teri Reserve in Tiruchendur Taluk is a large block of about 12,000 acres consisting of extensive dunes of loose shifting red sand, the reclamation of which has provided the Forest Officer with a very interesting but difficult problem.

8. *River systems.*—The hydrology of the division is simple as all the rivers flow East or South East. The importance of the ghat forests as catchment areas of the various streams and rivers which irrigate the plains, cannot be overestimated. The main rivers in the division which are also important irrigation sources are—

(1) The Tambaraparni, the chief river of the division, drains with its tributaries an area of about 1,750 square miles and from its source in the Periya Pothigai, to its mouth in the Gulf of Mannar is 75 miles long. Owing to its extensive catchment area in the ghats, it enjoys the full benefit of both monsoons and its bed is never dry. Its chief tributaries in the ghats are the Peyar, Ullar, Kariar and Serviar in the Government Forests and the Pambar in Singampatti Zamin. In the plains the first tributary to join the river is the Manimuttar which, rising in deep shola above Sengalteri, is reinforced by the Varattar and Kusanguliar. It is the principal source of irrigation to the Singampatti zamin. The next affluent is the Varahanadhi which brings down the joint waters of the Ramanadhi and the Jambunadhi, both the latter having their sources in the hills above Mela Kadayam. The Gatanadhi into which flow the waters of the Kalar and Karunai Ar from the Sivaisalem Hills, joins the Varahanadhi near Pappankulam and flows into the Tambaraparni on its left bank at Tiruppudaimarudur. The Pachaiyar, rising in the hills above Terkuviravanallur, joins the Karumandiaman channel and irrigates portions of the Nanguneri and Tinnevelly taluks before joining the Tambaraparni. The last affluent, the Chittar, rises in the hills above Kuttalam, into which it precipitates itself in a succession of beautiful falls. Its catchment basin in the hills being small, floods descend rapidly and the river is dependent for its supply, on the vast area, which it drains in the plains. It joins the Tambaraparni at Sivalapperi after irrigating some 27,000 acres in the Tenkasi and Tinnevelly taluks.

(2) South of the Pachaiyar basin the Nanguneri Taluk is drained by the Nambiyar and its tributaries the Narakadu Ar, and the Kodamadi Ar. This river reaches the plains at Tirukurangudi and is generally in flood only in the north-eastern monsoon, the " freshes " received in the south-west monsoon extending only to the foot of the hills where they are utilized extensively for wet cultivation.

(3) North of the Chittar basin in the Sankarankoil Taluk, are from South to North the Hanumanadhi, the Kuliratti Ar, Kottaimalaiyar and Rasinga Ar; the water they bring down from the hills in October to January is almost entirely absorbed by a network of tanks.

(4) Finally in the Srivilliputtur Taluk, we have the Mudangiar, the Athithondu Ar, the Chittar, and the Periyar, all fed principally by the north-east monsoon.

9. *Importance of river systems.*—With the exception of the Tambaraparni very little of the waters of the other rivers enumerated find their way to the sea. The rivers are thus of the greatest importance not only because their lower reaches pass through cultivated land but also because they all serve as feeders to the large network of tanks which are such a characteristic feature of the irrigation system of the division.

10. *The Papanasam Reservoir Project.*—So long ago as the thirties of the last century, a project for providing a reservoir in the upper reaches of the Tambaraparni, by means of which it would be possible to hold up the flood waters of the river and regulate their distribution had been mooted. It was expected that such an arrangement would conserve the water which in times of flood flowed into the sea, and provide a more regular supply to the irrigation system of the river valley, thus contributing towards a reduction of the remissions of land revenue during unfavourable seasons. The idea owed its origin to Col. A. T. Cotton, but it was left to Captain Horsley (1854) to formulate a scheme. His proposal was to throw across the river, about a mile above the Sorimuthayan temple and five miles from the Papanasam fall, a dam 50 feet high and 100 feet broad which would flood the river valley up to the Banathirtam cataract, and store up the waters of the Kariyar and Pambar. The storage thus effected was to be supplemented if necessary by a second lake below the Serviar junction where the river-bed was 300 to 400 feet wide and flowed between high rocky hills. On investigation, an estimate of $1\frac{1}{2}$ lakhs for the Sorimuthayankoil reservoir was prepared and it was calculated that the drainage of 25 square miles would be stored in the basin, and that 8 inches of rainfall would fill the

reservoir. In 1872 further investigation disclosed, that a dam 80 feet high for the reservoir would impound only 22 million cubic yards of water and as this was insufficient, proposals for a reservoir here or higher up the valley were definitely abandoned. In 1875 Major Mullins revived the scheme, and after further investigation decided that the most suitable site for a dam was a spot about a mile above Papanasam, where the river passes in two channels through low rocky hills, the valley above being wide and open. Here he thought that a reservoir of considerable capacity could be built at a moderate cost. The scheme was condemned by engineering opinion on the ground that the area of drainage had been wrongly calculated, and the rainfall statistics incompletely compiled. In 1911 interest was again revived in the scheme, but beyond steps being taken to compile an accurate record of rainfall and the discharge of the river, no progress was made. The subject has since then been periodically revived, thanks mainly to the efforts of the District Irrigation Committee; it has been decided however that as an irrigation project alone the project would not be remunerative, but as a combined hydro-electric and irrigation scheme it would pay handsomely provided that an adequate demand for power was created by the establishment of a paper mill at Ambasamudram, with a capacity of 10,000 tons of pulp per annum. In the absence of private enterpise in this direction, however, the scheme has been shelved indefinitely.

SECTION 3.—GEOLOGY, ROCK AND SOIL.

11. *General*.—The rocks met with during the Geological Survey of the division arranged in descending order are—

(1) Archæan Rocks, Gneisses and Granites.

(2) Gritty sandstones (Cuddalore Sandstones).

(3) Lateritic conglomerates and gravels.

(4) Subrecent marine beds, limestones and grits (upraised coral beds).

(5) Fluviatile and marine alluvia, kankar deposits.

(6) Blown sands red ((teris); white (coast dunes).

(7) Soils and sub-aerial deposits.

12. *The ghats*.—The principal underlying rock throughout the ghat forests, is a granitoid gneissic formation; it is a pale quartzo—felspathic banded rock. containing narrow veins of black mica and intercalated with numerous small pale red or pink garnets. From its large development near Cape Comorin, it has been called the Cape Comorin type. The bedded structure of this rock is admirably displayed in the beautiful Kolundamamalai Hill. Scattered outcrops of hornblendic gneiss, rich in iron, occur in the Manpothai Reserve and in the Sivaisalem and Vasudevanallur hills. Seen at its best, scattered in the Sivaisalem hills, are large patches of a coarse tufaceous conglomerate containing a high percentage of limestone. Water flowing over or percolating through this rock, carries away in solution a great deal of lime which is deposited in stream beds or more picturesquely *in situ*, in the form of stalactites and stalagmites in the interstices of the parent rock. Outcrops of the underlying rocks appear at almost all elevations owing to the rugged nature of the country, and sometimes necessitate the exclusion of appreciable areas from the Small Timber cum Fuel and Fuel Working Circles. Smaller outcrops when present in a coupe also contribute towards a diminution in the price per acre offered for the coupe.

13. *The plains*.—On the plains the most conspicuous outcrops are the numerous masses of granular quartz, fine examples of which are to be seen in the Vallanad reserve, and to a smaller extent in the Valaikulam and Sappaniparambu reserves. The rock approaches in appearance a glassy quartzite, the granular quartz bands being found intercalated with bands of varying thickness of typical granitoid gneiss, which owing to its greater susceptibility to weathering is more extensively denuded.

14. *Soils*.—The two great groups into which the soils of the division may be divided are the *red* and the *black*. The black cotton soil or *regur* is restricted to the cultivated area in the plains and is therefore of little interest to the Forest Officer. The red soils being generally the result of decomposition *in situ* of underlying ferruginous rock, vary considerably in character.

(*a*) Over hornblendic and other ferruginous forms of gneiss, the soil is of *deep red colour* with high iron content. This soil tends to become swampy in the wet weather and hard and baked during the dry weather, possibly due to pan formation at no great depth below the surface. Tree growth, especially teak, does not flourish on such soils.

(*b*) The soil derived from the decomposition of the highly silicious variety of gneiss, i.e., the Cape Comorin type, is more sandy and of *pale red colour*. Where this soil is present in sufficient depth, and the rainfall comparatively abundant, the best deciduous forests are to be met with.

(*c*) The deep red loamy soil to be met with along the foot of the ghats is very probably a pluvial deposit brought down directly from the mountain flanks. Some of the best natural teak forests in the division—the Ayyanarkoil Felling Series—are to be met with on this soil.

(*d*) Along most of the river banks are to be found alluvial deposits, varying in depth and extent according to the frequency of floods and the width and steepness of the river valleys respectively. The soil is usually light red in colour and rather sandy. It has a high lime content usually and this may account for the fact that teak does not thrive on it. It is usually clothed with a good growth of semi deciduous forest species.

(*e*) Near the granular quartz beds the soil is very gritty and light brown in colour, narrow strata of quartz pebbles being found only 1 to 2 feet below the surface. *Albizzia amara* is the principal species on such areas.

(*f*) In the evergreen forests the soil consists mostly of a dark clayey loam—the argillaceous nature being probably due to the disintegration of felspar aided by a plentiful supply of humus.

15. *Aeolian formations.*—There is no part of the Presidency in which blown sands play so large and important a part as in the plains of this division. They are of two kinds differing both in colour and origin—the red sands or teris, the white sands or coast dunes. Of these the former are the more interesting and important—interesting because of the obscurity attaching to their origin, and important, because they comprise the whole of the Kudiraimozhi Teri Reserve. The *teris*, it is believed, owe their origin to the action of heavy and continuous gales, prevailing from May to September during the south-west monsoon. By these fierce winds, the dry surface of the broad belt of red loam which skirts the eastern base of the ghats, is swept clean, and vast clouds of red dust are carried eastward to the coast, and there meeting the fresh sea breezes are precipitated, giving rise to the red sand hills or *teris*. At these times the eastern horizon as seen from the hills, seem to be on fire, so vividly does the evening sun light up the great clouds of dust driving before the monsoon gales. Enormous tongues of flame seem to leap up in the air, while the non-illuminated parts of the dust clouds simulate smoke, the whole scene bearing a marvellous resemblance to a forest fire, for which it is likely to be mistaken by the uninitiated. The *teris* have been deposited upon and around a mass of impermeable marine limestone elevated a varying height above sea level. This accounts for the fact that all rainfall, except the heaviest showers, is absorbed at once, and flows out *below* the sandy layer quietly and continuously; this is especially noticeable along the northern edge of the *teri* where the sandy deposit is shallowest. It is here that advantage is taken of these subterranean springs by the ryots who excavate channels of 12 feet depth and more, to meet these springs and conduct their water for irrigation purposes to field and market gardens which are among the richest in the division. These channels reveal that in many places the percolation of rain-water has given rise to a cementation of the ferruginous and silicious particles into a quasi-lateritic formation. It is well known that the advance of teri sands from time to time has caused damages by burying fields and gardens and even occasionally houses. The rate of advance of the sands in the adjacent Satankulam Teri has been computed by Lieut.-Colonel Branfell of the Great Trigonometrical Survey, to have been 1,000 yards, or nearly 17 yards a year, during the 60 years which elapsed, since Colonel Lambton in 1808–09 fixed his Trigonometrical station on the top of this *teri*. In the four years 1869–74 the advance was only at the rate of six yards per annum. In both cases the direction of advance was the same, i.e., towards east, south-east. Much has been done to check this advance by extensive planting of palmyras, but much more remains to be done. The *teris* are by no means barren sand heaps. Mixed with the silicious grains, is very frequently a percentage of fine red clayey matter large enough to make, in the presence of water, a very fairly productive soil.

16. *Depth of soil.*—The depth of soil is very largely a function of the steepness of the locality. On the steep hill slopes the soil is barely a foot deep, while on the scattered plateaux it is more than 15 feet to 20 feet deep as shown by road sections. All variations between these limits are to be met with. In the *teri*, the sand deposits vary from 8 feet to 35 feet and more.

17. *Drainage.*—The surface drainage is good in most of the area, where the rainfall is below 100 inches. In the reed areas where the rainfall goes up to 225 inches vast swamps are frequently to be met with. The drainage of the sub-soil however is extremely variable, especially on parts of the Mundanthorai plateau where, owing presumably to the presence of a clayey substratum near the surface, comparatively large areas become water-logged during the monsoons.

18. *Conclusion.*—The configuration of the ground, the composition and depth of soil and the degree of drainage are factors which have an undoubted effect on the distribution of species and on the quality of locality. The frequent and striking variation in the quality of the locality as reflected in the height growth, even in the same felling series, is thus easily accounted for.

SECTION 4.—CLIMATE.

19. *General.*—Being the most southerly division in India and therefore nearest the Equator, and shut off as it practically is on the west, by a high barrier of mountains, from the ameliorating influence of the south-west monsoon, the climate on the plains and on the lower foot hills up to an elevation of 1,000 feet to 1,500 feet is generally hot and dry. The appended table reproduced from the District Gazetteer gives a fair idea of the average maximum, minimum and mean shade temperatures prevalent at the division at head-quarters, Palamcottah. Since 1911 temperatures have not been officially recorded. The figures relate to the period 1893–1911 :—

Month.	Aevrage maximum temperature.	Average minimum temperature.	Average mean temperature.	Remarks.
January	88·1	71·8	79·9	The highest temperature rerorded is 107·1 17th May 1906) and the lowest 64·9 registered on three occasions in January and February.
February	92·6	72·8	82·7	
March	96·7	75·3	86·0	
April	98·5	78·3	88·4	
May	100·9	80·3	90·6	
June	96·9	79·4	88·1	
July	95·3	78·9	87·1	
August	96·5	78·6	87·5	
September	97·3	78·4	87·9	
October	93·7	76·3	85·0	
November	88·5	74·2	81·3	
December	86·2	72·2	79·2	

Since it would be of great interest to know the temperatures prevailing from time to time in the various Forest camps, the provision of cheap but efficient maximum and minimum thermometers in at least the more frequently visited forest bungalows is desirable.

20. *Temperatures.*—It will be seen that the maximum temperature is 94° ± 7° and the minimum temperature 76° ±4°. The average mean temperature is the highest for any district in the Presidency. The hottest months are April and May. Early in June strong westerly and south-westerly gales set in with the break of the monsoon on the hills, and these moist winds perceptibly cool the air throughout the division. The maximum benefit from this moderating influence is obtained at places situated opposite the gaps in the hills, such as Kuttalam and its environs opposite the Ariankavu pass, Sivaisalem opposite to the Sivaiselam gap, and Tirukurangudi opposite the Nadugani gap. With increasing elevation also, the temperature falls rapidly and the hill camps of Sengalteri 3,150 feet and Mudaliaruthu 4,000 feet are delightful throughout the year.

21. *Rainfall.*—The appended table gives statistics of the average rainfall on the plains of the division for the more important recording stations. For purposes of comparison, figures are given for each of the four quarters, into which from a meteorological point of view, the year divides itself :—

Stations.	Years recorded.	January-Ma ch.	April-May.	June-September.	October-December.	Total,
Tenkasi	1870–1914	5·48	5·10	9·45	20·29	40·32
Kadaiyam	1906–1914	4·31	2·47	5·46	25·22	37·46
Sivagiri	1905–1914	4·75	3·86	4·54	23·35	36·50
Ambasamudram	1870–1914	5·87	3·62	3·14	22·42	35·05
Kadayanallur	1905–1914	3·87	2·44	4·70	21·38	32·39
Koilpatti	1902–1914	1·29	5·29	5·24	17·42	29·24
Nanguneri	1870–1914	4·15	3·14	3·10	18·67	29·06
Palamcottah	1870–1914	3·42	3·93	2·27	18·12	27·84
Sankarankoil	1870–1914	3·09	4·27	2·50	15·77	25·63
Srivaikuntam	1870–1914	2.83	2·87	2·05	17·44	25·19

It will be noted that normally two-thirds of the annual rainfall is recorded from October to December, and that the mean avearge for the division is in the vicinity of 30 inches.

The annual rainfall at the various forest recording stations for as long as reliable statistics are available is given in Appendix I. The table abstracted below shows the rainfall for a selected number of years in the 15-year period ending 1932. Abnormal years, and years for which only incomplete figures are available have been ignored. For convenience four monthly periods are taken as the rainfall from May-August may be reckoned as due to the south-west monsoon, that from September-December to the north-east monsoon, and the figures from January-April denote the rainfall for the interregnum between the two monsoons. Of course the value of such a classification is vitiated to some extent by the early or late appearance of the respective monsoons, the north-east monsoon being the principal offender in this respect, as it frequently breaks out only in December and overlaps into late January.

Rainfall.

Name of station.	Elevation in feet.	January-April.	May-August.	September-December.	Total.	Average years.
Srivilliputtur Range.						
Athithondu	500′	9·25	6·38	29·51	45·14	10
Mudaliaruthu	4,000′	12·85	8·34	32·27	53·46	13
Mudangiar	300′	11·76	5·10	23·98	40·84	11
Kuttalam Range.						
Sengalmari	714	14·45	5·98	23·71	44·14	8
Kuttalam	750′	13·13	26·86	29·27	60·26	12
Ambasamudram Range.						
Thirthakarai	850′	17·51	25·79	38·64	81·94	12
Kuduvarai	1,036′	19·22	36·76	40·93	96·91	12
Kuttalam Kalaruvi	2,156′	20·16	48·04	43·07	111·27	12
Mundanthorai	655′	18·01	14·41	31·93	64·35	11
Taravittanparai	746	11·46	13·64	26·54	51·63	8
Kannikatty	2,550′	20·97	51·55	46·33	118·85	11
Kalivelipil	4,040′	28·38	66·47	69·14	163·99	9
Nanguneri Range						
Sengalteri	3,151′	18·89	22·01	38·44	79·34	12
Nazareth	75′	6·60	3·50	18·62	28·72	8

22. *Inferences.*—The rainfall is thus a function of two determinants, varying with the elevation and the situation. It is the latter factor which determines principally the degree of rainfall received during the south-west monsoon. Thus Thirthakarai and Kuttalam situated in the Sivaisalem and Shencottah gaps respectively, receive a greater supply of rain than their elevation above mean sea level warrants. Again Taravittanparai which is higher than Mundanthorai and only about one and a half miles from it, receives less rainfall, as the high Kottaimalai ridge to the south-west of the former, shuts off much of the rain.

The rainfall figures for Kalivelipil 4,040 feet are so capricious as to raise serious doubts as to their reliability. They vary from 80·85 inches in 1918 to 378·84 inches in 1931. Situated as this station is, about 7 miles from Kannikatty in dense reed jungle haunted by elephants and infested by leeches, and therefore apt to be avoided by the forest subordinates who are usually timorous plainsmen, it is not believed that any useful purpose is served by its retention. The Taravittanparai gauge is also superfluous. In view of the importance of the teak plantations in the Kariar valley, where there is no gauge the Kalivelipil gauge could be shifted to this place with advantage. Nanguneri Range contains only one recording station. The Taravittanparai gauge could therefore be more usefully utilized at Sivanaperi, and two more gauges one mid way up the Kodamadi Ar valley, in Nanguneri Range, and the other at Nazareth in the Kudiraimozhi Teri Reserve, erected; vide paragraph 504 under miscellaneous prescriptions.

23. *The south-west monsoon.*—Only the Tambaraparni and its main affluents come really under the influence of the south-west monsoon, which usually breaks in the first week of June and continues to the end of August with irregular intervals of sometimes prolonged duration. The reason for this is that this river, and to a lesser extent its northern affluent the chittar, have their head waters rising well within the limit of the area, over which rain clouds rest continuously. The positions occupied by the clouds during this monsoon appear at first sight to be somewhat capricious, but they are doubtless in great measure due to air currents caused by the peculiar configuration of the mountains (referred to above) which mostly terminate eastward in very abrupt and precipitous scarps. This monsoon does not benefit the plains of the division to any appreciable extent, except by giving rise to the formation in some seasons of severe local thunderstorms which are sometimes accompanied by precipitation.

24. *The north-east monsoon.*—The north-east monsoon from October to December is not absolutely reliable in the division and if it fails, or as is more usual, if it is untimely, the most important dry crops under rainfed tanks cannot be raised and much distress ensues. Strangely enough, the failure of the monsoon in one season, is usually followed by excessive rains in the succeeding season, and consequent extensive and destructive floods, as owing to the flatness of the sea board nearly up to the foot of the ghats, the rivers and streams, all flow in wide shallow valleys. The most serious of such floods occurred in 1810, 1827, 1847, 1869, 1874, 1877 (two floods), 1880, 1895, 1914, 1923 and 1931. Enormous damage to irrigation works and roads is caused, and whole villages and large numbers of live stock are destroyed. The people however have learnt to expect

such visitations, and take precautions, so that loss of human life is comparatively insignificant. The greatest recorded flood occurred in December 1923 when the water rose to 31 feet at the Tinnevelly bridge.

25. *Conclusion.*—To recapitulate, the bulk of the rain is derived from the north-east monsoon from about the middle of October to the end of December. The south-west monsoon—June to August—only benefits the interior forests adjacent to the main water shed, and also the forests in the neighbourhood of the Shencottah, Sivaiselam and Nanguneri gaps. The forests in the Sankaranainarkoil and Srivilliputtur taluks do not benefit to an appreciable extent from this monsoon. The light irregular showers, are a very important factor and are preceded frequently by violent thunderstorms, which occur during the interregnum between the two monsoons. These showers perform a valuable function in decreasing the danger from fire and promoting the germination of seed, but are apt to interfere with burning operations in regeneration areas. The failure of these showers invariably hearlds a bad fire season, as the hot dry westerly gales which sweep the outer slopes of the ghats from June to September are a fruitful cause of disastrous fires.

26. *Health.*—With the exception of Kannikatty and its environs, the Kariar and lower Serviar valleys in Ambasamudram Range, the Alagarcoil valley in Srivilliputtur Range, and Sivanaperi in Nanguneri Range, all of which have a bad reputation for a particularly virulent type of malaria, the rest of the division is comparatively healthy. Kuttalam is believed to be feverish in the hot weather. The whole of the ghat forests of the division however, with the exception of the reserves noted below (which are class II special tracts) have been a class I special tract since 6th February 1933 :—

Number of maps.	*Name of Reserve.*
3	Kuttalam upper slopes.
52	Kuttalam, Kadayanallur and Krishnapuram upper slopes extension II.
48	Kottalam, Kadayanallur and Krishnapuram upper slopes extension III.
6	Kalakad Teak tract I.
76	Addition to Reserve No. 27.

The classification is amply justified inasmuch as, owing to the complete absence of hill villages, and the necessity for conveying camp equipment and all provisions by head loads, with labourers recruited from the plains, touring in the hills is both expensive and arduous.

SECTION 5.—WATER-SUPPLY.

27. *General.*—Mention has been made in paragraph 8 of the principal perennial streams; there are however a number of similar streams of lesser importance. The water-supply at the various camps in the division is generally sufficient throughout the year. The spring at Mudaliaruthu in Srivilliputtur Range, has been known to dry up occasionally during the hot weather, but the comparative unimportance of this camp does not justify expenditure on sinking a well. In camps where a suitable water-supply from natural sources is not available, wells have been dug. The stream which is adjacent to the Rest House and Ranger's Quarters at Sivanaperi is apt to cease flowing during the hot weather, and the pools thus caused in its bed provide a good breeding place for mosquitoes. Bags of saw dust soaked in kerosene oil were dumped in the principal pools annually, but this anti-malarial measure did not have much effect. The possibility of digging a channel in the stream bed so as to connect the principal pools in the vicinity of the buildings deserves investigation.

SECTION 6.—DISTRIBUTION AND AREA.

28. *Distribution.*—The fortsts of the division have a total extent of 404·68 square miles and are distributed over seven revenue taluks as shown below :—

Taluk.	Area of taluk in square miles.	Area of forest in square miles.	Percentage of forest area.
Tinnevelly district—			
Tiruchendur	323	17·77	5·50
Srivaikuntam	361	7·95	2·20
Nanguneri	693	87·45	12·62
Ambasamudram	490	139·34	28·44
Tenkasi	403	37·97	9·42
Sankarankoil	634	42·64	6·73
Ramnad district—			
Srivilliputtur	436	71·57	16·41
	3,340	404·69	12·12

The percentage of reserved forest area to the whole area of the district works out at 12·12 per cent for the Tinnevelly district.

29. *Area.*—The following statement shows the area of reserved forest in each range :—

Range.	Area in acres.
Srivilliputtur	45802·06
Kuttalam	51588·28
Ambasamudram	83211·94
Nanguneri	78395·39
Total ...	258997·67

SECTION 7.—BOUNDARIES.

30. *General.*—The external boundaries of the area under this working plan are partly natural (or requiring no special maintenance, as in the case of the common water shed boundary between the Tinnevelly district and Travancore State and the Ramnad district and the Gandamanaickenoor and Saptur zamindaries), and partly artificial requiring periodical clearing.

31. *Natural boundaries.*—The following are the natural external boundaries :—

(1) The common water shed boundary between Tinnevelly district and Travancore State running from Tiruvannamalai mottai in Nanguneri Range almost to Sivagiri Hill Peak in Kuttalam Range, with breaks where the Singampatti Zamin, the Shencottah enclave, and the Vairavankulam Zamin intrude between the reserved forests.

(2) The common water shed boundary between the Ramnad district and the Gandamanaickenoor and Saptur Zamins.

(3) The Tambaraparni river from its source up to Mundanthorai, which forms the common boundary between the Singampatti Zamin and the Papanasam Reserved Forest.

(4) The Rasinge Ar which is the common boundary between the Sivagiri forests and the Vasudevanallur Reserved Forest.

(5) The Periyar which is the common boundary between the Srivilliputtur Reserved Forest and Saptur Zamin.

32. *Artificial boundaries.*—Other external boundaries are artificial. They may be subdivided into "Political" and "Other reserve boundaries." Under "Political" come all the boundaries mentioned in paragraph 31 as well as the following :—

(1) The southern boundary of Kalakad Reserve from cairn No. 38 to the Travancore frontier watershed.

(2) The western boundary of Terku Viravanallur Reserve and the northern boundary of the Kalakad Reserve up to the Travancore frontier, which form jointly the southern boundary of the Singampatti Zamin. These two reserve boundaries are imperfectly demarcated by a few rock marks which besides being difficult to find are frequently duplicated along two different lines. The description of boundary in the settlement records is not clear, and varies both from the actual boundary on the ground and from the boundary as depicted in the 1 inch scale maps. There is not much exploitable forest along this boundary but it is essential, with a view to avoid future litigation to demarcate clearly, as early as possible, at least the portion of the line running from cairn No. I (at the junction of the vandal odai with the reserve forest boundary on the plains) to Panchantangi mottai, so that the working of the fuel coupes in the Vadagarai Felling Series during the period of the working plan may not be hindered by legal difficulties.

(3) The western boundary between the Aladiyur Reserve and Singampatti Zamin. This is badly overgrown, and should be cleared and kept clear, as the adjacent forests in the zamin are being worked by the zamindar and encroachments may occur.

(4) The portion of the common boundary between the Kuttalam Reserve and Travancore state forests running from cairn No. 182 to the water shed.

(5) The western boundary of Vadagaraimelpadagai reserve.

(6) The common boundary between Vellakalteri state forest and Chinnakadu Reserve.

(7) The common boundary between Kadayanallur Reserve Forest and Vairavankulam Zamin.

(8) The common boundary between Vairavankulam Zamin and Krishnapuram Reserve.

(9) The common boundary between Krishnapuram Reserve and Chokkampatti Zamin.

(10) The common boundary between the Srivilliputtur Reserve and the Settur Zamindari.

33. *The Travancore Tinnevelly frontier.*—This boundary was demarcated, presumably by the Survey of India, by cut lines and 2½ foot stone pillars or survey stone at salient points, the former being marked with conch marks on the Travancore side and arrow marks with reserved forest letters on the British Government side. Where pillars could not be sunk, the conch and arrow marks were carved on the surface of embedded rocks found on the line. The line is now overgrown, and its maintenance considering the fact that it is a water-shed boundary about 100 miles in extent at elevations from 3,000 to 5,000 feet and more is not a practical proposition.

In G.O. Mis. No. 1609, Revenue, dated 23rd August 1928, the Travancore Durbar gave their assent to the proposition that the clearance of the common boundary between the Presidency and the State, and the repair of boundary pillars on this boundary be carried out by officers of the Madras Government, half the cost of such work being debitable to state revenues provided that

(1) the estimates for the work contemplated were sent in advance to the Durbar so as to enable the latter to express its approval or otherwise,

(2) the date of commencement of the work was communicated to the Durbar sufficiently early so as to enable it to depute its officers to see the work in progress if necessary.

In G.O. Mis. No. 1795, Revenue, dated 7th August 1928, it was ordered that "all frontier boundaries between Indian States and the Presidency *marching along with reserved forest* should be inspected by the Forest Department once in three years." The expense and difficulty of carrying out such a work in this division, was brought to the notice of Government and the order was subsequently cancelled in B.P. No. 98, Press, dated 13th November 1929, communicating paragraph 3 of G.O. No. 1377, Revenue, dated 9th July 1919, and G.O. No. 2859, Revenue, dated 3rd August 1918. No clearing or inspection of this boundary by Forest Officers is therefore now necessary.

34. *Zamin boundaries.*—With the exception of the common boundary between the Aladiyur Reserve and the Singampatti Zamin, none of the other zamin boundaries inspected were demarcated by cut lines *and* stone pillars. In places where exploitation is going on or may take place in the future on either side of the common boundary between zamin or state forests and reserved forests, it is essential that the boundary be maintained adequately both with a view to avoid litigation and to prevent fires from crossing. The maintenance of such lengths of boundary lines as fire lines will accordingly be prescribed.

35. *Other reserve boundaries.*—The line of separation between the reserved forest and cultivation on the plains, is demarcated adequately by a 12-15 feet wide cleared line with stone pillars at each angle numbered serially for each block, with intermediate cairns where necessary. The clearing of these boundaries is a matter for the local beat subordinates, and the only defective clearing noticed was in the Sivaisalem and Kalakad beats. Where the boundary adjoins grass or woodland owned by pattadars, it is essential that the beat subordinates be compelled to keep a 20 foot line cleared of all growth in order to minimize the danger from fire as these patta lands are burnt annually by graziers, sometimes with the consent of the pattadar. The numbering of the cairns frequently does not coincide with the numbers marked on the 4 inches : 1 mile Survey of India sheets. The cheapest way to rectify this error would be to correct the latter.

36. *Encroachments.*—The only encroachment noticed was a small area of some 40 acres at the place in Kadayam beat, where the Ramanadhi river crosses the reserve boundary. The encroachment appears to be quite an old one but is not posted in the record copy of maps in the District Forest office. This should be done at an early date and the position regularized by the issue of a disreservation notice in the *Fort St. George Gazette.* The position of the encroachment has been roughly marked in the 4 inches scale map sheet No. 1 of Papanasam Reserve.

A number of encroachments have been recently discovered in the Kudiraimozhi Teri Reserve, the boundaries of which are in need of verification.

37. *Internal boundaries.*—The boundaries of the various coffee estates in the Kuttalam, Sivaisalem and Nanguneri hills are also imperfectly defined. Many of the old cairns have been demolished and the boundary in most cases is so overgrown as to be of little value. In view of the fact that most of the proprietors of these semi abandoned estates

work them mainly for forest produce such as charcoal and timber, it is of prime importance that the boundaries should be cleared, demarcated and maintained. The clearance is manifestly in the interests of the owner, and it is only just that he should maintain the boundaries. It is suggested that the grant of a property mark annually to a proprietor for the transport of forest produce from his estate, be made contingent on the adequate maintenance by him, of his estate boundaries.

The western boundary of the Kattalaimalai estate is now cleared annually, the estate authorities contributing half the cost. Its eastern boundary was intended to be the bed of the Kariar river but owing to the bed having shifted from time to time, areas on the left bank of the Kariar are now within the estate, and vice versa. It would contribute much towards reducing friction between the forest and estate authorities if this boundary were permanently demarcated.

SECTION 8.—LEGAL POSITION, RIGHTS AND CONCESSIONS.

38. *Ownership.*—All the reserved forests are the absolute property of the state and are not encumbered with any rights of importance. Such rights as have been admitted at the time of settlement consisting mainly of rights of way for men and cattle, are shown in the respective Section 16 notifications for each reserve, which have been recorded in the District Forest office in the reserve book.

The following statement gives the numbers and dates of the respective Section 16 notifications of all the reserves in the division arranged by ranges :—

Range and name of reserve.	Area in acres.	Number and date of section 16 notification.	
		Number.	Date.
Srivilliputtur range—			
Srivilliputtur Ghat forest upper slope ..	14,796·80	11	20th December 1883.
Unnipattimalai	550·40	230	30th July 1889.
Sappani Parambu, B. 18	381·87	311	24th October 1889.
Srivilliputtur Ghat forests lower slope ..	28,136·19	175	21st April 1891.
Valaikulam Parambu	1,145·60	335	23rd July 1891.
Khansapuram	535·83	383	22nd August 1899.
S. No. 1869 to 1871 of Valaikulam	7·51	234	8th May 1908.
S. No. 1725 of Valaikulam	0·23	195	4th May 1909.
Sappani Parambu extension	5·97	135	2nd March 1911.
Addition in Valaikulam S. No. 1861 and Kollankondan S. No. 2359	27·45	25	23rd December 1911.
Pillayarnatham extension V.	12·71	108	22nd February 1912.
Valaikulam Parambu extension	34·33	266	4th June 1912.
V (a) Sundarapandiam	34·52	265	Do.
Addition to Pudupatti	49·16	267	Do.
Extension to Venkateswarapuram	34·54	303	17th June 1912.
Addition to Lakshmipuram	35·60	151	19th March 1913.
Do. Valaikulam	5·53	492	9th October 1913.
Do. Alagapuri	0·34	507	31st October 1913.
Do. Khansapuram	5·69	74	27th January 1914.
S. No. 1570 Valaikulam	1·76	490	9th November 1917.
Total ..	45,802·06		
Kuttalam range—			
Kuttalam reserve forest upper slopes ..	7,350·77	11	20th November 1833.
Kadayanallur upper slopes	5,036·80	11	20th December 1883.
Krishhapuram upper slopes	3,654·40	11	Do.
Puliangudi Chintamani, Vasudevanallur upper slopes	16,038·40	11	Do.
Chinnakadu reserve forest	1,388·80	248	9th June 1890.
Vadagarai Kilpadagai 3 (c)	582·40	178	10th April 1891.
Kadayanallur upper slopes 3 C (2) lower slopes	1,171·20	178	Do.
Vadagarai Melpadagai 3 (b)	432·20	178	Do.
Extension I Kuttalam No. 3 and lower slopes	1,698·00	178 and 179	10th April 1891 and 16th March 1901.
Krishnapuram upper slopes extension ..	1,946·50	178 and 156	10th April 1891 and 14th March 1901.
Puliangudi, Chintamani-Vasudevanallur lower slopes	10,496·00	176	10th April 1891.
Alakondal, Nelliyuthu, Sermalai	163·04	281	7th June 1898.
Chintamani Block 'A' and 'B'	321·46	231	19th May 1899.
Extension III Kuttalam, No. 3 lower slopes.	144·50	231	7th June 1898.
Do. II do. ..	133·00	205	21st May 1902.
Vasudeva Estate	162·00	165	22nd March 1910.
Panjantangi Estate	72·80	535	25th November 1911.
Chinnakadu reserve forest addition	0·90	28	15th December 1911.
Naranapuram reserve forest	390·31	193	29th March 1911.
Kadayanallur addition and small bits (9) ..	33·12	53	18th January 1912.
Vadagarai Melpadagai North 'A' South 'A' and 'C'	70·96	438	27th September 1912.
Krishnapuram upper slopes addition ..	12·42	473	29th October 1912.

Range and name of reserve.	Area in acres.	Number and date of section 16 notification.	
		Number.	Date.
Kuttalam range—*cont.*			
Addition to Vasudevanallur	18·29	414	19th September 1912.
Do. Melpuliyangudi	8·83	411	Do.
Do. Melchintamani	6·21	439	3rd October 1912.
Do. Naranapuram	7·07	440	Do.
Do. Thirumalaipuram	2·23	437	Do.
Old S. No. 1357, east of Ilanchi	31·51	49	17th January 1913.
Addition to Kuttalam reserved forest, Trikulachalaparvatham estate	26·66	470	6th October 1915.
Hope estate	183·50	17	9th October 1920.
Total ..	51,588·28		
Ambasamudram range—			
Papanasam Ghat forest, upper slopes ..	63,838·85	11	20th December 1883.
Do. lower slopes	19,172·66	534	27th October 1890.
Hill enclosing upper and lower slopes ..	189·44	19	20th December 1911.
Kaloli enclosure	8·78	81	31st January 1912.
Slopes Vikramasingapuram, village	2·21	581	28th November 1913.
Total ..	83,211·94		
Nanguneri range—			
Kalakad Tirukurangudi Ghat forests, upper slopes	33,508·39	11	20th December 1883.
Kalakad Teak tracts, I to III..	271·20	165	10th June 1889.
Kalakad Tirukurangudi Ghat forests lower slopes	21,083·20	533	27th November 1890.
Kolandamamalai reserved forest	1539·17	88	17th February 1890.
Terku Veeravanallur reserved forest ..	3,187·20	534	27th November 1890.
Vallanad hill block 'A', & 'B'	4,647·20	465	14th October 1891.
Kudiraimozhi Teri reserved forest	11,371·77	309	21st June 1892.
Lands to block 'A' I to III	428·28	390	3rd August 1896.
Manpothai reserved forest	1,242·00	511	8th November 1898.
Vanamutti..	1·99	194	25th April 1898.
Mahendragiri	33·78	249	18th May 1898.
Nadugani bit I	3·84	487	12th December 1903.
Valliyur reserved forest..	605·11	51	28th January 1904.
Nadugani bit II	6.46	244	14th June 1905.
Kulisalkidai	0·99	244	Do.
Jadikai Tottam	2·55	244	Do.
Ladan Tottam	10·22	247	20th July 1906.
Taraganar estate..	110·00	243	10th May 1907.
Valliyur reserved forest extension	112·50	478	6th November 1908.
Mayaparambu estate	109·20	497	5th September 1910.
Vallanad addition	11·90	16	24th December 1910.
Addition to map No. 20, S. Nos. 483 and 484, Malayadipudur..	6·50	147	11th March 1912.
Addition to map No. I, Nadugani last bit, S. No. 982 of Tirukurangudi village ..	1·32	349	14th July 1913.
Addition to map No. I, Mahendragiri, S. No. 984/2	9·88	163	12th July 1921.
Addition to Karumandiamman, S. No. 803 shola	90·74	110	21st April 1923.
Total ..	78,395·39		

The numbers and dates of Section 16. Notification pertaining to the reserves in the division handed over to panchayats or to the Public Works Department for managements are set out below :—

Range and name of reserve.	Area in acres.	Number and date of section 16 notification.	
		Number.	Date.
Public Works Department, Tuticorin Port Trust—			
Kalivayur reserved forest	158·07	197	6th February 1889.
Mullakadu reserved forest	949·26	297	3rd November 1923.
Hare Island reserved forest	146·12	297	3rd November 1923.
Pannaiyadi Island reserved forest ..	105·59	297	3rd November 1923.
Panchayat—			
Gangai kondan reserved forest	13,91·00	363	2nd August 1898.
Sivalaperi reserved forest	213·14	149	10th April 1891.
Melapattam reserved forest	1,000·00	588	3rd December 1897.
Wolf Hill reserved forest..	848·13	474	11th September 1896.
Talaiyuthur Block A & B	493·74	368	24th July 1896.
Do. reserved forest	890·81	150	10th April 1891.
Kottamalai reserved forest	883·20	304	24th October 1889.
Kavalkattiparambu reserved forest	371·20	303	Do.
Kottamalai addition	19·27	18	21st December 1911.
Do. extension	137.61	529	21st November 1912.
Kottamkulam Block 17	550·40	214	27th May 1890.
Total ..	8,157·54		

39. *The Gandamanaickenoor path.*—This path in Srivilliputtur Range threatens to be a source of danger to the efficient protection of the forests on either side of it from fire. At the time of settlement it was admitted as a right of way for men and cattle. It is now used by a contractor of the Gandamanaickenoor zamindari for the transport of scantlings of evergreen species from the sholas in this zamin. This by itself is not objectionable, but the contractor also gets an average revenue of some Rs. 12,000 per annum by issuing grazing permits for cattle in the zamin forests which have been leased out to him. These cattle go up this path which climbs 4,000 feet in 4 miles in batches of 100 to 200 at a time. As the path is steep the cattle have to be rested en route in the reserved forest and this has resulted in the annual firing of suitable halting places so that the cattle may be fed gratis en route. The fires have naturally spread up hill and eaten into the edges of the adjacent Tirunatteri shola. It is essential from the point of view of safeguarding the irrigation on the plains that shola forest should be induced to cover these steep slopes and this will be done in the course of time in the absence of fires. Although the contractor's right to convey timber along this route has been tacitly admitted by the registration of his property mark annually for the last decade, it is not a route recognized by the Timber Transit Rules prevalent in the division. It is suggested therefore that the contractor's property mark be registered in future, only on condition that he enters into an agreement that he will be responsible on pain of forfeiting a security deposit, of say Rs. 100, for all fires which have occurred in the vicinity of the path. This arrangement is quite equitable as there is no possibility of any cattle or men authorized by the forest department, using this path above the cairn's line.

40. *Tree pattas.*—A peculiar survival is the existence of tree pattas, issued in pre-settlement days to pattadars, for the usufruct of palmyras and fruit bearing trees growing in the reserves. The table below shows the extent of such rights, the assessment therefor being collected by the revenue authorities and credited to the Forest department. These rights are being gradually extinguished by the death of the patta trees.

Name of reserved forest and authority.	Taluk and village.	Palmyras.				Other trees.					
		Paruvam.		Kattu.		Olaivettu.		Mango.		Tamarind.	
		No.	Tax.	No.	Tax.	No.	Tax.	No.	Tax.	No.	Tax.
			RS. A. P.		RS. A. P.		RS. A. P.		RS. A. P.		RS. A. P.
Kudiraimoli Teri reserved forest—	Tiruchendur—										
G. O. No. 636, Revenue, dated 21st July 1892 B. P. For No 390, dated 21st June 1892.	1 Kachanvilai.	1994	124 10 0	1969	61 8 6	..	..	19	4 12 0	..	..
	2 Nalumavadi.	1565	97 13 0	1531	47 13 6	..	..	..	..	..	..
	3 Kanam.	2397	148 11 0	2440	76 4 0	..	..	..	..	..	..
Kalakad reserved forest—	Nanguneri—										
G.O. F. No. 294, dated 27th November 1890.	1 Kovilammal puram.	49	3 1 0	70	2 3 0	340	8 6 0	..	..	..	..
	2 Idayankulam.	92	5 12 0	290	9 1 6	..	..	..	..	..	..
	3 Malayadipudur.	204	12 12 0	237	7 5 6	149	2 5 3	..	..	23	5 12 0

CHAPTER II.—DESCRIPTION OF FOREST.

SECTION 1—COMPOSITION AND CONDITION OF CROP.

41. *General.*—Elevation, rainfall, the nature of the soil, and proximity to cultivation and therefore to injury by man, are the principal factors which control the types of forest growth in the division. For convenience of description the main types enumerated below may be distinguished. The line of distinction between two types is by no means clear, one type tending to merge almost imperceptibly into another. The area data given under each type should, therefore, be considered only as a rough approximation, as both the value of the standing growth and the precipitous nature of most of the country did not justify expenditure on very detailed stock mapping into types.

42. *Type I* consists of an extremely xerophytic type of vegetation, the principal species being *Dalbergia multiflora, Acacia planifrons, Acacia latronum, Zizyphus xylopyra, Albizzia amara* and *leucophlœa, Balsamodendron berryi;* and *Dichrostachys cinerea;* the undergrowth consists mainly of *Dodonca viscosa, Pavetta indica, Cassia auriculata, Plectronia parviflora* and *Euphorbia tirucalli* with strobilanthes in the moister parts. Examples of the forests of this type are the plain forests of Vallanad in Srivaikuntam taluk, the Valaikulam and Sappaniparambu reserves in Srivilliputtur taluk and the Kolundamamalai and Manpothai reserves in Ambasamudram taluk. Being closest to cultivation, this class of forest suffers most from overgrazing and injuries by man. The surface soil being hard and of low permeability, what little rainfall there is runs off the surface of the hilly ground rapidly with the result that although coppice regeneration is fair, natural seedling regeneration is conspicuous by its absence. The result is that stocking is variable, being very poor in parts. Some form of artificial regeneration,

whereby the rapid descent of rain water may be arrested, and the moisture made available for the seedlings raised, is clearly called for, in order to enable the complete stocking of these forests. Money spent on such measures would, we consider, be amply recouped from the increased yield, in view of the proximity of such reserves to consuming centres and their consequent accessibility. The present average money yield of fuel series in this type of forest is 6 to 8 annas per acre per annum.

Area : 11,570 acres.

43. *Type II* is a less xerophytic type which extends for the most part over the outermost slopes of the ghats from the margin of cultivation to an elevation of 300–500′. Here the principal species are teak, *Albizzia amara, Zizyphus sp., Givotia rotteriformis, Cochlospermum gossypum, Protium caudatum, Acacia leucophlœa, Dolichandrone crispa, Morinda tinctoria, Butea frondosa*, etc., the undergrowth consisting mainly of *Dodonea viscosa, Ixora parviflora, Pletronia parviflora, Carissa carandas, Cassia auriculata* and *Maba buxifolia.* This type is probably only a progressive succession on type I and a regressive succession of type III described below caused principally by destructive fires and excessive grazing in the past. Area : 38,080 acres.

44. *Type III* may be described as an associate formation of deciduous species degraded in parts by recurrent fires. It comprises all the forests on the outer slopes above type II up to an elevation of about 1,700′. In favourable localities where the soil is richer, e.g., the Ayyanarkoil series—or the rainfall greater—e.g., the Kuttalam series west of the Chittar—this type comes down to the margin of cultivation. The principal species associated with this class of forest are teak *Petrocarpus marsupium, Dalbergia sissoides, Albizzia lebbek, Albizzia odorotissima, Grewia sp., Chloroxylon swietenia, Terminalia belerica, Schleichera trijuga, Stereospermum chelonoides, Pongamia glabra* (along streams), *Anogeissus latifolia, Sapindus emarginatus, Melia dubia, Melia azadirachta, Careya arborea, Dalbergia paniculata, Eugenia jambolana, Bridelia retusa, Hardwickia binata*, etc. The undergrowth consists principally of *strobilanthes*, grasses, *Helicteres isora, Pavetta indica, Mundulea suberosa, Murraya exotica, Glycosmis pentaphylla*, etc. Creepers are of very frequent occurrence, the principal being *Acacia intsia, Pterolobium indicum* and *Atylosia sp.* Where fires are rare and the rainfall over 50″ the growth is dense, and the species in admixture good. The locally famous slow grown teak of the division is found in this type of forest, the best growth being found between 500′ and 1,000′ elevation. The only sandal in the division, in the Alagarcoil valley of Srivilliputtur range and to a smaller extent in the Kuttalam fuel series, occurs in this type of forest. Practically all the fuel series are to be found in these two types of forest. Whereas coppice regeneration is generally good, seedling regeneration leaves much room for improvement. There is a distinct need for artificial regeneration not only to accentuate the density of stocking where necessary but also to increase the number of the more desirable and valuable species, such as teak, *Dalbergia latifolia* and *sissoides* and *Pterocarpus marsupium* where these species can be grown satisfactorily. The present average money yield of type II forest, as exemplified by the Ambur Felling Series, is 7 annas per acre per annum; while that of the type III forest varies from Rs. 2 to Rs. 2–8–0 per acre per annum, the Kalakad and Kuttalam Felling Series respectively being taken as limiting examples. This forest type is eminently suited for the production of small timber if worked under " simple coppice " on a rotation of 35–40 years. Rigid fire protection and closure to grazing for at least the first decade of the rotation are the two essentials. Area : 31,740 acres.

45. *Type IV* where fires are recurrent especially on steep slopes, a Savannah formation appears. Here the canopy is very open, high grass (*Andropogon bladii* principally) overruns the area, and only fire resistant species like *Anogeissus latifolia, Terminalia chebula, Pterocarpus marsupium, Buchanania latifolia, Careya arborea, Phyllanthus emblica* remain scattered over the grass in a damaged condition. The area below the Sengalteri Rest-house is a characteristic example. This class of forest is not suitable for exploitation at present but with adequate fire protection would probably revert to type III in process of time. It comprises many of the so-called " Hill grazing " compartments of the division and will be regarded as having for the present only a protective function. Area 53,040 acres.

46. *Type V* where the rainfall is over 75″ and elevation over 1,000′ and the soil suitable the deciduous forest gives way to a semi-evergreen type the principal species met with being *Balanocarpus utilis, Hopea parviflora, Pterospermum rubiginosum* and *glabrescens, Aglaia courtallensis and barberii, Nephelium longanum, Hemicyclia venusta, Hardwickia pinnata, Stereospermum chelenoides, Dalbergia latifolia, Chukrassia tabularis, Artocarpus integrifolia, Bischofia javanica, Carallia integerrima, Diospyros sp.*, together with a host of others less known species. The undergrowth here consists of strobilanthes. *Glycosmis pentaphylla, Heleteres isora*, canes, etc. Small patches of this type of forest are found along streams at elevations below a 1,000′ but the greater portion occurs between 1,000′ and 2,000′ elevation. Where the soil, as reflected in the height growth, is good,

this type of forest is ideally suited for conversion into teak plantations. The majority of this type shows a marked uniformity as far as the density of stocking is concerned, which is quite good. This is probably accounted for by the increased rainfall and consequent increased vegetative activity. The quality of locality however varies greatly with the depth of soil, and as a few years are necessary for the factors of locality to manifest themselves in the young crop, an unwise selection of an area for teak planting is apt to become apparent only after four to five years, when it is too late to remedy the defect. Parts of the Kodamadi and Kariar teak plantations exemplify this. The height growth of the existing forest is the only safe criterion to go by in selecting areas suitable for teak planting. Area : 14,700 acres.

47. *Type VI* is the evergreen rain forest or shola forest. This is the most highly developed ecological type of vegetation in the division. The great mass of this class of forest commences at an elevation of about 2,000′ and extends upwards to nearly the crest of the mountains up to 4,500′, the growth deteriorating rapidly along the windswept ridges, both in quality and volume per acre. The whole of the hills above 2,000′ are not however clothed with shola forest. There is much bare and precipitous rock and extensive areas where the rock is near the surface are covered with high grass, *Phœnix sylvestris*, and stunted tree growth. Small patches of isolated shola, cap most of the sheltered faces of the peaks and thus enhance their scenic value. Much of the true shola forest has been destroyed by extensive clearings made by hill tribes—the Kanis—and coffee planters in the past. The secondary shola growth, consisting chiefly of *Macaranga*, *Mangifera*, *Clerodendron*, *Dyospyros sp.*, *Eugenia sp.*, *Myristica sp.*, etc., which is met with in abandoned coffee estates and old Kani clearings, are a feature of the tract, characterstic examples of the former being the old Kuliratti and Taraganar estates in the Nanguneri hills, and of the latter the Sembatota on the left bank of the Kariar. Area : 44,100 acres.

With decreasing rainfall the minimum elevation at which the true shola appears increases. Thus in Nanguneri Range where the rainfall is less than in the Ambasamudram Range, the shola forest starts at about 3,000′ elevation and is at its best at 3,500′ to 4,000′, deteriorating higher up. Similarly in the Srivilliputtur Range where the rainfall is even below that obtaining in the Nanguneri sholas, the true shola appears only at about 3,500′ and rapidly deteriorates above 4,000′.

The characteristic shola type of forest occurs principally in Ambasamudram Range, where it forms a three-storeyed high forest. In the topmost canopy occur principally *Mesua ferrea*, *Cullenia excelsa*, *Gluta travancorica*, *Pallaquim ellipticum*, *Hopea parviflora*, *Heritiera papilio*, *Dysoxylum malabaricum* and *beddomei*, *Myristica beddomei*, *Eugenia sp.*, *Elæodendron glaucum*, *Elæocarpus tuberculatus*, *Canarium strictum* and *Vateria indica*. In the second storey, besides pole growth of the species enumerated above occur *Aglaia species*, *Myristica malabarica*, *Artocarpus integrifolia*, *Anacolosa densiflora*, *Gordonia obtusa*, *Nephelium longanum*, *Pœciloneuron pauciflorum*, *Lansium sp.*, *Litsaea sp.*, *Pygeum wightianum*, *Filicium decipiens*, *Garcinia sp.*, etc. In the lowest tier, besides sapling growth of the species mentioned above, is found *Agrostistachys longifolia*, *Mallotus sp.*, *Cinnamomum gracile*, *Aporosa acuminata*, *Hydnocarpus alpina* and the bright crimson fruited *Baccaurea courtallensis*. The undergrowth consists principally of rattan, wild cardamoms, *Pandanus sp.*, *Solanum sp.*, and the dreaded, but comparatively rare devils nettle, *Laportea crenulata*. Picturesque ferns and palms, *Pinanga dicksonii* and *Caryota urens* are also scattered all over the forest. Area : 24,600 acres.

The Nanguneri sholas are characterized by the total absence of *Gluta travancorica*, the comparative rareness of *Mesua ferrea* and the great preponderance of *Pallaquium ellipticum* and *Mangifera indica*. The dominant association in the Sengalteri shola is the *Pallaquium-Mangifera type*. Around Netterrikkal a few big sized *Podacarpus latifolia* occur, but beyond the botanical interest centred in the fact that it is the only indigenous conifer in South India, the tree is not of importance as it is not present in exploitable quantities. The Nadugani and Mahendragiri sholas are also of poor quality, the principal saleable species being *Bischofia javanica* and *Heritiera papilio* of comparatively small dimensions. Area : 9,100 acres.

The Kuttalam sholas are all very deficient in exploitable species, and are generally poor, all the best shola areas having been acquired by coffee planters in the past and partially destroyed. Area : 6,700 acres.

The Srivilliputtur Range contains a number of patches of shola varying in size from 100 acres to 350 acres, which are surrounded by grass land. The sholas are not either so dense or so luxuriant as in the Ambasamudram Range and, owing to the fact that the Travancore high ranges and the upper Palnis keep off much of the rain which would otherwise fall on these hills, the locality is far less moist. The principal species are

Acrocarpus fraxinifolius, Cedrela toona, Mesua ferrea, Eugenia sp., Pallaquium ellipticum, Bischofia javanica and *Mangifera indica.* The maintenance of the essential character of these rain forests, whether exploitable or not, and the undertaking of inexpensive measures for their extension are matters of the first importance, in view of the great part they undoubtedly play in conserving and regulating the water-supply of the rich and extensive irrigated lands in the plains, some of which, in the Tambaraparni valley, bear a double crop assessment of Rs. 22–8–0 per acre per annum, a rate unknown elsewhere in the Presidency. Area : 1,350 acres.

48. *Type VII* embraces the areas covered by the eta reed. Near the summit of the hills above the belt of shola forests and along the higher slopes of the various mountain ranges, 3,000′ and above, extensive areas are covered with eta reed, *Ochlandra brandisii* and *Ochlandra travancorica*, an erect reed like gregarious bamboo " forming impenetrable thickets of 10′ to 15′ high from which stand out scattered trees of *Vernonia monosis* and *Eugenia sp.* " (Brandis). This reed not only occurs in vast areas to the exclusion of all other vegetation, but also encroaches into sholas wherever the fall of a big tree on the borders of a shola lets in sufficient light to permit of its growth. Streams also play a great part in dissemination of the seed of the reed, many of the streams originating in reed areas, and flowing through sholas containing a dense growth of reeds on their banks wherever light conditions are suitable. A picturesque feature of the reed areas is the gregarious growth of the palm *Bentinckia coddapana,* which usually cultivates the steepest portions of rocky peaks and knolls above 4,000′ elevation, and contributes much towards alleviating the monotony of the vast sea of eta. That the reed encroaches on the shola and not vice versa is, we consider, borne out by the frequently observed fact that large trees of *Pallaquium ellipticum, Mesua ferrea,* etc., are frequently noticed growing *isolated* in a sea of reed jungle. This class of forest has not been exploited in the past to any appreciable extent but has great economic possibilities which are commented on in paragraph 82 below. One rather remarkable feature is that whereas the eta reed occurs widespread in Kuttalam, Ambasamudram and Nanguneri Ranges it is conspicuous by its absence at similar elevations in Srivilliputtur Range. The lower rainfall may account for this. Area : 35,100 acres.

49. *Height growth.*—The height growth is a function chiefly of three variants the species, the factors of locality, and the rainfall. In type I forest which is mainly scrub jungle the height growth at maturity rarely attains 12 to 15 feet, the average being in the vicinity of 10′. Type II varies from 12 to 25′, and type III which comprises the best deciduous forest, from 25 to 50′. In type IV the height growth on account of adverse factors like fires, and the diminishing fertility of the soil, recedes to 20 to 25′, the average being well below 20′. The semi-evergreen type maintains a height of 35 to 60 feet, merging almost imperceptibly into the evergreen shola forest. The height growth of the latter varies with the rainfall and the depth of soil which tend to increase it, and the elevation which tends to depress it. Thus on the windspent ridges above 4,000′ the forest is barely 30 to 40′ high, while in the undulating valleys at 2,500 to 3,000′ elevation of which the forest at Kannikatti is typical, the forest has an average height of 120 feet.

50. *Density of stocking.*—In most of the fuel felling series this is probably between 0·7 and 0·8 on an average, though it is so variable that in the same coupe a fully stocked area and an area where the stocking is below 0·5 is often met with. Type IV forests, however, are the most sparsely stocked, the density of stocking being well below 0·2 as a rule. The semi-evergreen and evergreen forests are fully stocked, the blanks met with being obviously areas where either nature has given up the attempt at afforestation as an impossibility, or areas which have been destroyed by man in the past and are under process of being reclaimed to forest growth.

51. *Teak plantations.*—Mention must be made of the existence of some 260 acres of teak plantations formed in the past by enthusiastic District Forest Officers with a view to testing the suitability of semi-evergreen forest for teak. The oldest plantation made in 1907 has already more than paid for itself from thinnings; given the necessary soil conditions, such conversion is a most profitable forest investment. Another encouraging factor is that the existing growth is saleable and fetches as much as Rs. 20 to Rs. 50 per acre.

In the choice of areas for teak planting the nature of the soil is an important factor. A simple rule is not to choose areas where there is too much red in the soil. The highly ferruginous nature of such soils has been found by experience in this division, to have a definitely deleterious effect on the subsequent growth of the teak. Pale red soil, river alluvium, and the light brown soils found in semi-evergreen areas have been found to be most suitable. This rule also applies to the introduction of teak in regeneration operations in the fuel series.

52. *Seed years*—Most of the deciduous fuel species seed fairly abundantly annually. It is a matter of local experience that a year of bad rainfall is *followed* by a particularly good seed year. The evergreen species, however, are somewhat capricious in this respect

and good seed years occur at intervals varying from two to four years. Such information as is considered reliable regarding the time of flowerng, seeding, etc., of our more important fuel and timber species has been collected and is detailed in Appendix II. It has been found that Range Officers' annual reports on this important subject have tended to be more or less faithful copies of their predecessors' reports, and are therefore liable to the suspicion of inaccuracy.

SECTION 2.—INJURIES TO WHICH THE CROP IS SUBJECT.

53. *Climate.*—The chief climatic factor to be feared from the standpoint of regeneration is the failure, partial or total, of the monsoons. Untimely rainfall also affects regeneration operations. The south-west monsoon breaks usually early in June, but heavy and continuous rainfall is not unknown in May. Time is the essence of all regeneration operations, and expenditure on replacing casualties, can only be kept within reasonable bounds, if such operations are conducted so as to take immediate advantage of such rain that occurs. It is therefore important that all is ready for teak planting by the end of April at the latest. The frequent and sometimes prolonged breaks in this monsoon point to the advisability of " stump planting " of teak rather than dibbling or transplanting, as the reserves of food material stored in the " stump ", and the depth of planting which enables it more quickly to tap the lower soil moisture, will aid the plant in tiding over rainless periods of short duration. In addition to these factors the size of the stump will enable it to withstand displacement by floods to a greater extent, a matter of great importance in localities where a rainfall of over 16″ in 24 hours is not unknown; such was experienced during the north-east monsoon of 1931 at St. Mary's, Kattalaimalai estate. Another influence of early rainfall even if light, is to hinder the proper burning of debris in regeneration areas. The so called *Kodai* rains of April, which are of immense help in assisting the agriculturist to get a " golden " tilth for ploughing, frequently obstruct burning operations, and the necessity for completing burning in all regeneration areas by the end of March is indicated. The north-east monsoon is also capricious appearing at any time from the middle of October to the first week of December. Its late appearance usually heralds a season of floods. All preparations for regeneration operations in the fuel series which come under the influence of this monsoon only, are best completed by the end of September.

54. *Winds.*—The hot dry gales which sweep the eastern face of the ghats from June to September generally from the west (although owing to the formation of the mountain masses the wind direction is apt to vary from south-west to north-west) do some damage especially to standards in the " Coppice with Standards " coupes, and to young regeneration areas, where the teak plants are frequently broken, blown down or deprived of their leaves. The necessity for carrying out fellings, as far as possible against the wind direction is indicated. The impetus these winds give to forest fires is however a greater menace to the forest.

55. *Fire.*—The maxim that " fire is a good servant but a bad master " is seldom impressed on humanity with greater force than it is on the forest officer. The fire season in the division extends for seven months from April to October, fires being especially frequent and disastrous in those portions of the division which do not come under the beneficent influence of the south-west monsoon. The maximum intensity is attained in such areas from May to September. The following table abstracted from the fire reports of the division shows the average monthly incidence of fires during the decennium 1922–1931.

Name of range.	Srivilliputtur.		Kuttalam.		Ambasamudram.		Nanguneri.		Total.	
Area in acres.	45,802·06		51,588·28		83,211·94		78,395·39			
Month.	Number.	Area in acres.	Number.	Area in acres.	Number.	Area in acres.	Number.	Area in acres.	Number.	Area in acres.
January ..	..	..	..	..	..	..	0·2	19·0	0·2	19.0
February ..	0·3	26·8	1·0	33·4	0·2	72·5	0·3	3·9	1·8	136·6
March	0·6	39·1	2·4	55·3	0·1	4·5	0·8	61·2	3·9	160·1
April	0·4	7·5	2·7	154·0	0·2	13·0	1·1	48·6	4·4	223·1
May	0·2	1·7	10·4	1,445·0	5·2	1,635·0	3·5	599·1	19·3	3,680·8
June	2·1	147·1	4·5	314·1	4 0	352·2	2·7	813·8	13·3	1,627·2
July	3·5	473·8	3·2	318·5	1·7	121·6	1·2	179·3	9·6	1,093·2
August	3·2	215·1	3·1	200·3	1·9	149·6	1·9	275·6	10·1	840·6
September ..	1·0	76·8	2·4	48·1	1·9	199·3	2·3	208·0	7·6	532·2
October	0·3	25·8	0·7	12·8	1·0	29·0	1·0	63·8	3·0	131·4
November ..	..	..	..	..	..	..	..	..	..	..
December ..	..	..	0·2	21·7	..	..	..	..	0·2	21·7
Total ..	11·6	1,013·7	30·6	2,603·2	16·2	2,576·7	15·0	2,272·3	73·4	8,465·9

N.B.—The figures under number of fires and area burnt have been obtained by dividing the total number of fires and the total area burnt respectively, during the decennium, by ten. The figures for the old Srivaikuntam Range have been ignored as both the number of fires and their extent are too insignificant to be considered.

56. *Incidence of fires.*—The low percentage of the average area burnt annually to the total area of the forest, namely, 2·21 per cent in Srivilliputtur Range, 5·04 per cent in Kuttalam Range, 3·14 per cent in Ambasamudram Range and 2·89 per cent in Nanguneri Range, which these statistics disclose, does not mean that the fire problem is not acute. The reprehensible tendency on the part of the forest subordinates to minimize greatly the reported area burnt in their own interests is largely responsible. The abstract is however of interest, in that it shows more or less accurately the average monthly incidence of fires.

57. *Causes of fires.*—Fires in the division are principally caused by graziers in search of tender grass for their cattle. This nefarious pastime of the ryot is more commonly practised in the various zamin and mittah forests of the division, where discipline is lax and retribution slow or absent, and where on account of the constant fires much of the original forest has been converted into poor grass land. The Chokkampatti and Vairavankulam mittahs in Kuttalam Range are characteristic examples, and a comparison of their present state with the state of the adjacent Government forests will convince even the most sceptical layman of the advantages of forest conservation, so striking is the difference. The need for safeguarding the forests of the division by fire tracing the common boundaries between the reserves and zamin forests is very pressing in view of the fact, borne out amply by fire maps of recent years, that the majority of fires have crossed over the common boundary from zamin forests. The zamindars are, or pretend to be, quite alive to the danger of fires and most of them have expressed their willingness to contribute labour or money towards clearing and fire tracing their common boundary. Advantage should be taken of this, to put the matter, by agreement, on a permanent basis. The solution of the fire protection problem as far as the reserves are concerned, lies in the *immediate* closure to grazing, of all areas burnt, on silvicultural grounds, to enable them to recover. Experience has shown that this is of value provided a consistent policy is followed. Closure, however, must be effective otherwise grazing fees merely find their way to the pockets of the subordinate staff instead of into the treasury. Frequent inspections of closed areas by the District Forest Officer and remorseless treatment of delinquent subordinates is what is needed. The necessity for putting out fires as soon as they are detected does not appear to have been sufficiently impressed on the subordinate staff, many of whom are not even aware of the provisions of section 23 of the Madras Forest Act, whereby the nearest villagers, contractors, labourers, etc., can be impressed by forest subordinates, on pain of penalties, to help in extinguishing fires. The present system under which forest subordinates are allowed on occasion to pay coolies for help in extinguishing fires cannot be sufficiently condemned. It is open to the serious abuse, that ryots in the off agricultural season may frequently set fire to the forests themselves, in the expectation that they may be paid by the department to extinguish such fires. A few judicious prosecutions would certainly bring round recalcitrant villagers to a sense of their responsibilities relating to fire fighting.

Apart from this source fires are also caused by the minor forest produce contractors' coolies, while searching for honey, gallnuts, etc., and a few fires escape from the charcoal pits of fuel contractors, mainly through carelessness. The ancient muzzle loading guns of illicit poachers, packed as the barrels are with gunpowder and paper wads also cause fires, especially as this class of ryot frequently haunts the forest during the nights of the fire season, when the weather is likely to be less inclement and scarcity of water concentrates game at well-known water holes.

58. *Fire damage.*—The chief injuries to the forest from fire are :—

The invasion of coarse grass to the exclusion of more desirable grasses and undergrowth, the killing back of valuable regeneration as well as of older trees, the scarring of trees, the scorching of foliage and consequent loss of increment, and the impoverishment of the soil through the removal of desirable humus and its sources; and last but by no means least, the probable reduction of the value of the forest as a catchment area. The history of fire protection in the division so far as it is known is given below. Although crown fires have not been reported many of the older trees, especially in type IV forests exhibit fire scars to a height of 20 feet. This may be due to the fact that where the canopy is very open, high grass invades the area, and ground fires in such localities are uncommonly fierce. In areas where there is a young crop, e.g., regeneration areas and coupes below 5 years of age, fires do very serious harm, and the special protection of such areas is indicated.

59. *Injurious plants.*—Grass is indirectly injurious on account of the enhanced fire risk, and is also directly harmful in removing nutrition and moisture from the surface soil to an excessive extent, thus preventing direct access of tree seeds to the forest floor. It also provides a poor quality of humus, and excludes the more desirable species of undergrowth which would enrich the soil and give useful material for burning in regeneration

operations. It has also a definite suppressing effect on regeneration of tree species, *Pterocarpus marsupium* especially persisting for years in a suppressed condition under its shade.

Lantana is also a pest as it makes progress through the forests difficult and also has a tendency to assume a scandent habit and swamp plantations and newly cleared areas. With the exception of portions of the Kuttalam Fuel Series in Kuttalam Range, the Ullar and Sivaisalem valleys in Ambasamudram and the Mungilpatti Kidai valley in Nanguneri Range, it does not seem to be a menace in the division. If uprooted wherever seen by the subordinates its rapid spread is not likely to be a cause for anxiety.

Creepers and climbers are especially destructive in young fuel coupes and regeneration areas, as they smother young regeneration for years thus materially reducing the mean annual increment of the forest. This is particularly noticeable in the moister areas such as Kuttalam and Mundanthorai. The most harmful are *Pterolobium indicum*, *Acacia intsia*, *concinna* and *pennata* and *Zizyphus rugosa*. *Caesalpinia mimosoides* frequently forms a thick matted scandent growth and is a troublesome weed in clearings. In the evergreens enormous climbers do a lot of damage by smothering the crowns and constricting the boles of trees.

Ficus species are scattered over the forest and do some damage by suppression of the more valuable tree species and sometimes constricting the boles of trees. They are not wholly injurious however, as in the Alagarcoil valley, sandal regeneration is strikingly good under *Ficus* trees, owing probably to the fact that they attract many birds when in fruit, and these assist in dispersal of sandal seed. In the Kudiraimozhi Teri reserve, *Ficus* cuttings are invaluable for afforestation purposes.

Loranthus is present but cannot be said to have assumed any serious proportions as a pest.

Prickly pear, an important pest in other divisions is hardly to be met with here owing probably to the past activities of the Cochineal insect. *Strobilanthes* is an important pest in all moist areas of the division. Its gregarious habit and its dense rapid growth enable it to cover completely large areas in short periods and thus swamp natural seedling and coppice growth completely. It is the strong light demanders like teak that suffer most. There is a clause in all fuel coupe agreements that this weed should be uprooted in all coupes wherever it occurs, but either this condition is not enforced rigorously or the treatment does not meet the case. The former view appears to be more probable, as it has been definitely proved elsewhere that cutting the weed below its prop or stilt roots has been successful as an eradication-measure. As this weed is a serious menace to the attainment of normal stocking in the fuel series rigorous measures for its eradication are called for. It appears to flower and die gregariously on the same area once in about 10 years, and a considerable revenue has been derived from its sale for fuel. Vide the table below which applies to the period 1922–33.

	Serial number and place or locality.	Amount realized.	Time allowed for removal.
		RS.	
1	Padarmalai and Koilteri Working Circle ...	150	1st July 1921 to 30th June 1922.
2	Kalakad Working Circle	105	Do. do.
3	Terku Veeravanallur	180	1st March 1922 to 30th June 1922.
4	Kadayanallur and Krishnapuram	182	15th June 1922 to 15th October 1922.
5	Athithondu section	2,200	15th January 1923 to 30th September 1923.
6	Mudangiyar section	710	Do. do.
7	Pudupatti section	700	2nd February 1923 to 30th September 1923.
8	Athithondu section	255	3rd July 1924 to 2nd January 1925.
9	Mudangiyar section	150	Do. do.
10	Mudangiyar section	215	3rd September 1926 to 2nd March 1927.
11	Puduppatti section	50	Do. do.
12	Athithondu section	405	Do. do.
13	Kadayanallur, Krishnapuram	250	26th October 1929 to 25th March 1930.
14	Kodamadi Range	215	4th March 1930 to 3rd May 1930.
15	Terku Veeravanallur (including Manpothai).	17	5th March 1933 to 30th June 1933.
16	Kalakad and Vadagarai South	33	Do. do.
17	Malayadipudur (South and North)	17	Do do.
18	Tirukurangudi and Parivarisurian (South and North).	27	Do. do.
19	Athithondu section	181	Do. do.
20	Mudangiyar section	36	Do. do.
21	Puduppatti section	51	Do. do.

Unfortunately there is no demand for the green weed or eradication measures on a large scale might have been a paying proposition, instead of being too expensive. Much can be done however to control the weed by introduction of a clause in all fuel coupe agreements, which must be rigorously enforced, insisting on the cutting of all *Strobilanthes* in the coupe below its stilt roots at the time of felling. Prompt measures taken

to sell the right to collect and remove flowering *Strobilanthes* will contribute towards minimizing the fire risk involved in having large areas of dead *Strobilanthes* scattered over the forest, and also assist in reducing the incidence of the pest, as much of the weed will be removed before it has seeded. It is essential however that removals should be capable of being adequately controlled by the subordinate staff, and for this purpose the unit of sale should be small, preferably a Forest Guard's beat, and the voidah limited to not more than three months.

60. *Fungi.*—The number and variety of the Fungi present in the division would make it a paradise to the collector. The huge bracket shaped *Polyporous* fungi seen in the evergreen sholas are a feature of the tract many of them however being saprophytic. Ground fungi, both poisonous and innocuous, are to be found scattered over the forest floor. Recently a fungus has been discovered doing great damage to and ultimately killing the young teak in patches in the plantations. The fructification has been sent to the Forest Botanist, Dehra Dun, for identification. The damping of seedlings in patches particularly in evergreen nursery beds, which are congested, is of common occurrence and should be guarded against by thinning out such beds, an operation which has been found by experience to be effective. Teak nurseries are also affected by an unidentified fungus with white underground hyphæ. Here again the disease appears to be due to congestion as, when the seedlings are notched out at an espacement of 4 inches by 4 inches, they are not effected.

61. *Insects.*—Defoliators and skeletonizers (*Hybloea puera* and *Hapalia machaeralis*) are present both in the teak plantations and to a less extent in the fuel series containing teak. Beyond a possible loss of the year's increment no more serious damage is done.

Damage by *Melolonthid* larvæ, so common a pest in nursery practice, has not yet made its appearance, but with the establishment of semi-permanent nurseries contemplated under this plan, this pest is likely to assume serious proportions.

Borer damage has not been noticed to any appreciable extent in teak. *Hopea* poles at Kariar were found killed by the borer *Massicus venustus*. In this form of damage, the point, or more frequently points, of attack were within 5 feet above ground level usually 3–4 feet. The larvæ make extensive galleries in the sap wood spirally up and down whilst young, and eventually bore about 1–1½ inches into the wood to pupate. The tree appears to die by being girdled. The damage to *Mesua ferrea* done by a Cerambycid borer, unidentified, is however much more extensive almost every tree over 1 foot girth being riddled by longitudinal and radial tunnels. The wood thus becomes quite unfit for railway sleepers, its principal use, and even under the most careful utilization the outturn in sleepers of the best trees of 7 feet girth is only in the vicinity of 35 per cent. It does not seem advisable to spend money on the artificial propagation of this species until some effective method has been discovered to control the pest.

62. *Animals.*—Elephants usually restrict their activities to the reed areas. Occasionally however they come down to the plains during the monsoons and do damage chiefly to the sandal in Alagarcoil valley. A narrow gorge has been blasted just at the point where the Mudaliaruthu-Puliuthu Bridle path crosses the Pemalai ridge. It is the belief of the ryots on the plains, that this is the *only* way whereby elephants can descend from the hills into the Alagarcoil valley, as previous to the construction of the bridle path, elephants were not known to visit this valley. With a view to preventing elephants from descending into the valley and destroying their crops, the local ryots, so they say, placed a strong wooden plank studded with big iron nails with their business points exposed upwards, across this gorge. This device was very successful in keeping the valley free of elephants for a couple of years, after which the obstruction was removed, according to the villagers, under the orders of the District Forest Officer. No official confirmation of this is discoverable in the records, but the problem of blocking the path for elephants *only* seems to be worth investigating both in the interests of the ryots and the valuable sandal growth in the valley.

Sambhur is responsible for a lot of damage to teak coppice shoots on the Mundanthorai plateau. The leading shoots are stripped of all the bark and die, being replaced by side shoots which are again similarly stripped. An enumeration carried out over a particularly bad area in the Koilteri Series showed that 88 per cent of the teak stools had been thus damaged. Fortunately this sort of destruction is restricted to the Mundanthorai plateau, where the sambhur have increased appreciably of recent years owing probably to the disturbance in the balance of nature, caused by the excessive destruction of carnivora on the plateau. Mundanthorai is an easily reached and very attractive shooting camp with the result that sportsmen frequently visit it with disastrous consequences to the tigers and panthers. Permission to shoot female and immature sambhur, with a view to reducing their numbers was accorded in 1932, but was immediately withdrawn

under the orders of the Chief Conservator of Forests as being liable to abuse in the absence of adequate control. It is considered that prohibition of the shooting of carnivora on the Mundanthorai plateau would, in time, restore the balance of nature. Fencing the whole of the annual coupe in the Padarmalai and Koilteri Felling Series where this type of damage is prevalent, is impracticable on account of the expense, as the annual coupe is about 100 acres in extent in each series and fencing for at least three years after felling would be necessary. The only course would be to organise beats for sambhur under departmental supervision with a view to reducing their numbers.

Rats and *porcupines* damage evergreen nurseries by eating up the fleshy cotyledons of young seedlings. Wild pig exhibit a great avidity for the cotyledons of *Balanocarpus utilis* but they also do good to the forest by raking up the soil in search of edible roots. Monkeys also are voracious consumers of many wild fruits and seeds; those of *Gluta travancorica* are however an exception. The leading shoot of *Artocarpus hirsuta* seedlings is frequently broken off and eaten by them. The Malabar squirrel is partial to seeds of *Dysoxylum malabaricum, Chickrassia tabularts* and *Acrocarpus fraxinifolius.*

63. *Grazing.*—The grazing incidence has been worked out at an average of 6·9 acres per cow unit. This is correct in theory but in practice the incidence varies inversely with the distance of the grazing area from the village. The outer slopes containing the majority of the fuel series are therefore grazed most heavily. Many of the so called hill grazing compartments are never visited by graziers owing to the fact that they are more than a day's march from villages, and penning in them has been prohibited as no agreement could be arrived at between graziers and the forest department on the important question of prevention of fires. There is however a distinct demand for the grazing in the following hill grazing compartments provided penning is permitted :—

Compartment 5 of Srivilliputtur Range.

Compartments 10 and 13 of Kuttalam Range.

A system of permitting penning in these compartments on condition that fire is rigorously excluded, would if popularized greatly relieve the present pressure on our fuel series. There is no question of the possibility of this privilege being abused by the ingress of foreign cattle, because the local ryot is emphatically not a stock breeder and the grazing on the hills is neither so extensive nor good as to attract cattle from other localities.

64. *Semi wild cattle.*—The semi wild cattle some 400 in the Kudiraimozhi Teri Reserve and about 300 in the Vallanad Reserve also do immense damage to the regeneration in these reserves, besides causing great damage to crops in the cultivated lands surrounding these reserves. These cattle owned largely by Maravas who are usually landless, are let loose in the reserves untended in order to evade the payment of grazing fees, and because local pattadars charge a higher grazing fee Re. 1 to Rs. 1-4-0 per head of cattle, for grazing in their patta lands. In times of drought these cattle feed in the forest, while when the crops are on the fields, they emerge from the forest and destroy the crops in the fields usually at night when their depredations cannot be checked. Long habitation in the forest has rendered them extremely shy of man and too ferocious to be caught. As a result of representations made to Government by the surrounding ryots, who complained of the destruction of their crops, the Maravas were at first compelled to enter into an agreement not to release their cattle from the village pen at nights. This agreement was not adhered to and in Government Order No. 554, Revenue, dated 1st March 1911, it was ordered that all semi wild cattle in Vallanad reserve should be shot after due notice to the villagers to remove their cattle. The reserve was accordingly closed to grazing as a temporary measure in July 1912 after 3 months notice in the District Gazette and shikaris permitted to shoot the cattle in the reserve without a licence. Only 4 heads of cattle were thus destroyed. The District Forest Officer subsequently reported that it would be far more satisfactory to capture the animals than to shoot them, as far less cruelty was attached to the former practice and a greater profit would result to Government as a carcass sold for about Rs. 4 while a live animal would fetch from Rs. 30 to Rs. 40 especially as they could easily be tamed in a month. The Conservator accordingly ordered that capturing was to be *preferred* to shooting.

Tenders were accordingly called for, and a very favourable one was received wherein the tenderer offered,

(*a*) to pay Rs. 20 for each head of cattle captured, cow, calf or bull,

(*b*) the material for stockades was to be provided by the department but the cost of felling and transport would be borne by the lessee,

(*c*) the period of the lease was to be one year.

This tender was unfortunately not accepted as the Conservator was averse to the grant of a one year lease in the interests of grazing; as the reserve had to be closed to grazing for this period. He also demanded a guarantee from the lessee that the whole

of the reserve would be rid of cattle, and this, the latter rightly refused to give. Departmental "Keddah" operations were accordingly resorted to in 1920–21 and a special duty Ranger and Forester posted in charge of the operations. Two stockades were erected at a cost of Rs. 788 and 26 head of cattle captured and sold for Rs. 513. A revenue of Rs. 299 was obtained by the sale of materials of the stockades; so that excluding expensive overhead charges a small profit of Rs. 24 was secured. Further details are available in R. Dis. No. 7 of 1921 of the Tinnevelly District Forest Office.

The discouraging results of departmental working led to the encouraging of private enterprise to capture the animals by netting. Licences were accordingly proposed to be granted to individuals in 1925 on condition that the 50 per cent of the sale proceeds of all animals caught would be given to the licensee. This offer did not prove sufficiently attractive, the prospective licensees sticking out for 2/3 of the sale proceeds. In 1929 a second attempt was made, the licensee being offered 3/4 of the sale proceeds of all animals caught by him. Altogether 39 animals were caught and a revenue of Rs. 360 less 75 per cent commission realised. The operation was brought to a sudden termination because one of the licensees was prosecuted and convicted, of having stolen a bullock. The supineness of the Ranger in having permitted the prosecution to take its course without aiding the licensee was a regrettable feature of the case.

The need for ridding the Vallanad reserve of these pests is pressing, if we are at all going to clothe it successfully with tree growth. The situation as far as capture of the cattle is concerned, is complicated by the fact that with the exception of a small portion consisting of fuel coupes under 6 years old, the whole of the reserve is open to grazing the grazing revenue being in the vicinity of Rs. 1,000 per annum. Thus before permitting capturing operations it is essential to close the reserve to grazing to avoid the possibility of cattle covered by permits, being captured. This not only would mean a considerable sacrifice of grazing revenue but also would involve hardship on the surrounding graziers who have limited grazing grounds. The best step under the circumstances would be to close the reserve during March—May when cattle can be fed on the fallow land surrounding the reserve, and by the organisation of beats by the Range Officer or District Forest Officer, to destroy as many of the cattle as possible by shooting. A great deal in the way of extermination can be done in 3 months by an energetic posse of subordinates. Capturing operations are not likely to meet the case as the ryot who owns the cattle knows that he can claim them when captured, or failing this buy them cheaply at the ensuing auction and put them back in the reserve for grazing. These alternatives are not present in the case of a dead animal. Not until owners are convinced that the conversion of these reserves into private grazing grounds principally for their benefit, will not be tolerated, will the problem of semi wild cattle be solved.

65. *Man.*—Situated as the forests are, close to cultivation on the populous plains, it is not surprising that the forest offences reported are numerous. The blood of their marauding and pillaging ancestors still runs, although in an attenuated form, in the Maravan and Thevan of to-day. The result is a constant defying of authority, and subordinates are frequently intimidated by the young bloods of the village so that many offences are not reported by them. One useful result of this however deserves comment. The District Forest Officer is almost invariably informed by the ryots by numerous anonymous or pseudonymous petitions as soon as the illegal acts or exactions of particular forest subordinates have become too oppressive. Many of these petitions are patently exaggerated but careful enquiry will almost invariably disclose a substratum of truth. Illicit grazing in closed areas and illicit felling of small timber and fuel are the principal offences. The ryot wants a particular shaped piece of timber for his plough and usually prefers to get it himself from the forest, and take what he considers the paltry risk of being caught, rather than get it from the stock in the forest contractor's depot. Protection against injuries from man however, generally good except in the Rengarcoil beat of Srivilliputtur Range, the Vasudevanallur beat of Kuttalam Range, the Kadayam beat of Ambasamudram Range, and the Kalakad beat of Nanguneri Range, where there is much room for improvement.

66. *Manure leaf.*—The removal of manure leaf from the forests of Nanguneri and Srivilliputtur Ranges is permitted on payment of 2 annas 6 pies per head load. The revenue realized for the decennium 1922–23 to 1931–32 is shown below :—

Year.	Nanguneri.	Srivilliputtur.	Total
	RS.	RS.	RS.
1922–23	4,375	—	4,375
1923–24	—	—	—
1924–25	4,814	3,771	8,585
1925–26	3,467	3,753	7,220
1926–27	3,703	98	3,801
1927–28	4,453	1,394	5,847
1928–29	1,836	141	1,977
1929–30	2,171	960	3,131
1930–31	1,754	691	2,445
1931–32	624	554	1,178

This pernicious system once prevalent over the whole division has been partly responsible for the progressive deterioration of the Simple Coppice Fuel Series on the lower slopes of the ghats. In theory no removals of leaves of fuel and timber species is permitted but in practice it is difficult to enforce this. In the interests of conservation a bold policy of closure of the forest to such removals is indicated. Such a policy has been successfully adopted in Madura division the reserved forests of which at one time were the biggest suppliers of manure leaf in the Presidency.

67. *Illicit offences.*—The following statement shows the number of cases reported under the main heads for the decennium, 1923–24 to 1932–33.

Number of forest offences.

	Grazing.	Felling.	Hunting and fishing.	Assault on subordinates.	Miscellaneous.	Total.
1923–24	209	499	3	1	13	725
1924–25	210	510	8	—	15	743
1925–26	185	540	12	—	7	744
1926–27	127	475	7	1	12	622
1927–28	186	511	4	—	12	713
1928–29	187	521	10	1	6	725
1929–30	176	441	—	1	8	626
1930–31	163	396	5	1	17	582
1931–32	183	498	10	1	11	703
1932–33	123	376	9	—	18	526

The average annual revenue derived from compounding fees in the division during the above decennium was Rs. 4,849.

SECTION 3—FAUNA.

68. *General.*—The scarcity of game has been a lament of every Forest Officer for the last decade. Wild pig, spotted deer and sambhur are still fairly numerous on the Mundanthorai plateau, and in Puliangudi and Vasudevanallur beats of Kuttalam Range. Elsewhere, especially round Kuttalam, in the Sivaisalem hills and in the Kalakad Series, with the exception of pig, game is very scarce. Illicit shooting in these three localities has assumed serious proportions, and there is little doubt that the forest subordinates connive at, and derive a considerable revenue from this poaching, as venison is highly prized among the local population, and skins are esteemed as household adornments. Professional shikaries are numerous and display an almost uncanny knowledge of the principal water holds and salt licks round which old *machans* are almost invariably seen. Since, in the long hot weather, game is forced to visit such places owing to the general scarcity of water, its destruction is comparatively easy. The grant of licences to the local population, ostensibly for the protection of their field crops, is also largely responsible for this destruction, as they are utilized for hunting in the reserved forest. Licences issued specifically for the pursuit of game in the reserved forests are comparatively few, averaging 25 for the decennium 1923–32. Game preservation would be greatly assisted were it possible to restrict the gun licences issued to the local population; but this, apparently, is opposed to the declared policy of Government. Failing this, game preservation could be promoted by the following measures :—

(1) The exercise of a greater amount of discretion in the issue of shooting licences. There is a 'black list' maintained in the District Forest office which does not appear to have been consulted in the issue of shooting licences. A licence for retainers should be issued only if the District Forest Officer is convinced that the licensee is not likely to abuse the privilege. It is deplorable that many so-called sportsmen take out a licence only to enable their retainers, usually skilled shikaris, to shoot game for them. Such a lack of sportsmanship should be rewarded, on discovery, by the posting of delinquent's name on the 'black list.'

(2) Forest subordinates should be rewarded on a more generous scale for good work in game preservation; at present, considering the temptations to venality, it is hardly surprising that many of them follow the more profitable line of least resistance.

Finally, it must be emphasized, that no satisfactory conservation of game can be accomplished unless the District Forest Officer is personally enthusiastic in the matter, and shows his subordinates that he is interested, both by rewarding good work generously and by punishing bad protection severely.

Black buck is fairly common in Vallanad reserve, and merit special protection, as they have disappeared from the panchayat areas where they were once numerous.

Bison.—There is a small herd of bison which frequents the sholas and grass areas around Netterrikkal. Bison spoor has also been observed in the Mungilpatti Kidai valley of Nanguneri Range. Elsewhere in the division they are absent.

Carnivora.—Tiger and panther are found occasionally mainly on the Mundanthorai and Kalakad plateaus. The shortage of game probably accounts for their comparative rarity elsewhere.

Bear.—The black bear haunts the shola forests throughout the division.

Ibex.—Ibex are found scattered over the division, their main habitat being the precipitous and grassy hills above 4,000 feet elevation. The principal haunts of this animal are :—

Nanguneri Range.—Tiruvannamalai, Naduterrimottai and Panjantangimottai.
Ambasamudram Range.—Chinnaadoomottai and Periadoomottai.
Kuttalam Range.—Variadoomottai, Generals Hill and Kulirattimottai.
Srivilliputtur Range.—Peimalaimottai and Sambangikidaimottai.

The localities in Ambasamudram Range are the most easily accessible and are therefore the most heavily poached. The need for preserving this interesting and rare wild animal from rapid extinction is very pressing.

Barking deer are comparatively rare though fine specimens in the Puliangudi beat of Kuttalam Range have been seen.

The sholas contain monkeys mainly of the langur variety and the Malabar squirrel is quite common.

69. *Game birds.*—The Jungle-Fowl is common throughout the division. Partridge is to be met with in Type I forest, principally in Vallanad, Rangarcoil and Valaikulam reserves. Green-pigeon is fairly common on the inner slopes especially along the various stream and river banks. The imperial pigeon is comparatively common in the less accessible shola forests.

Other birds of note in the shola forests are the Greater Horn-bill, the Whistling School Boy, the Racket-tailed Drongo, the Scarlet Minivet and the Hill Mynah.

In the lower forests the usual bird life of South India is abundantly represented, and many most beautiful birds as the Paradise Fly-catcher, the Golden Oriel, the Barbets, the Red-Vented Bulbul, etc., are frequently to be seen.

70. *Snakes.*—The Hamadryad is alleged to frequent rivers and streams in the shola forests but we are not able to confirm this. The Cobra and the Krait are however too common for comfort especially in the wooden sheds in the hills. Rat-snakes are frequently to be met with but are not poisonous.

CHAPTER III.—UTILIZATION OF THE PRODUCE.

SECTION 1.—AGRICULTURAL CUSTOMS AND WANTS OF THE POPULATION.

71. *Population.*—The population of the Tinnevelly district according to the latest census of 1931 excluding Anjengo sub-taluk amounts 2,040,141 or on an average to 473 to the square mile. The only taluk of Ramnad district with which we are concerned, namely, Srivilliputtur, has a population of 233,683, or 536 to the square mile.

The population is mainly agricultural, both dry and wet crops being grown. Rice cultivation occupies one-fourth the total cultivated area of the Tinnevelly district, the proportion in Ambasamudram taluk which possesses the best wet lands irrigated by the Tambraparni rising to two-thirds.

72. *Wants of the people.*—The chief forest requirements of the people are small timber for building and agricultural implements, fuel for domestic consumption and for cottage industries such as jaggery-making, lime and brick-kilns, pottery, etc., pasture for cattle, thatch-grass, and to a decreasing extent, leaf manure for the wet cultivated fields.

73. *Agricultural implements.*—The farmers stock in trade of implements is small; a light wooden plough for use in puddled fields, and a slightly heavier one for use when the field ploughed is in a comparatively dry state for broadcast sowing; a wooden plank for use in levelling the surface in wet fields, a *manvetti* or spade for light hoeing and clod-breaker for breaking up the ploughed up soil.

The plough consists of the handle, plough-share, shaft and yoke. Of these the plough-share requires most frequent renewal as it is most subject to wear. It has been ascertained from enquiry among the ryots that the plough-share has to be renewed annually for dry cultivation and biennially for wet cultivation, the average stock of plough-shares required being one per acre of cultivation. The remaining portions of the plough are only renewed triennially. The following table shows the species most prized for the various parts of a plough and other agricultural implements in the order of preference :—

Plough-share.—Chloroxylon swietenia, Acacia arabica, Albizzia amara and Mesua ferrea.

Shaft.—*Mesua ferrea*, *Grewia tiliæfolia*, teak.
Handle.—Teak.
Yoke.—*Pterocarpus marsupium*, teak. In addition any other species most easily available are used for the yoke and the handle.

The species most in demand for parts of country carts are in the order of preference :—
Spokes.—*Aglaia roxburghiana*, *Grewia sp.*, teak.
Felloes.—Teak mostly.
Chattams.—*Acrocarpus fraxinifolius*, *Dipterocarpus bourdilloni*, *Hardwickia pinnata*, *Palaquium ellipticum*, *Pterospermum rubiginosum*.
Vandipoles.—*Palaquium ellipticum* and *Hardwickia pinnata*.
Axle boxes.—*Hardwickia binata*, *Acacia arabica*, *Pterocarpus marsupium*.

74. *Houses*.—In the rich Tambraparni valley tiled houses are common, only the houses of the poorer labourers being thatched. In all the villages lying along the foot of the hills, thatch is rapidly giving place to tiles as a roofing material and this naturally means more substantial buildings of brick or stone and mud. Kongu (*Hopea parviflora*) a timber which possesses a peculiar fascination for the people of the division, is very extensively used even in preference to teak for building material, the local slow grown teak being highly prized for door and window frames and rafters. In the sparsely populated Koilpatti taluk where incendiarism is too common a pastime of the ryot, substantial houses are rapidly replacing the old mud walled and cumbu stalk thatched houses.

75. *The Palmyra*.—There is no single product of the division which provides an occupation for so large a number of its inhabitants as the palmyra (*Borassus flabelliformis*). There are over 10 millions of them scattered over the whole of the plains of the division, and a large number in the Kudiraimozhi Teri Reserve; it has been estimated that roughly five per cent of the population depend for their livelihood upon this tree. An ancient Sanskrit poem enumerates 801 uses to which the tree can be put, and a local Tamil proverb declares with more exaggeration than truth, that the palmyra lives for a thousand years, and continues to last when cut for another thousand years. Its durability is however unquestionable and accounts for its extensive use as rafters. Fibre for brushes and rope making is extracted from the leaf stalk which is also used as fuel. The leaf is used for thatching and basket making. The tender fruit, contains a translucent jelly like endosperm which is greatly relished. The inflorescence on both male and female trees, is tapped for the sap which exudes from it.

The tapping season commences in February and continues up to June. The daily yield of a normal tree varies between ½ to 1 Madras measure according to the number of spathes tapped. Left to itself the juice quickly ferments, and if fermented sap or toddy is not required, the interior of the pot is lined with lime. Only a small proportion of the sap produced in the division is utilized for consumption either as a sweet drink (pathnir) or as fermented liquor. The rest is boiled to produce either a coarse sugar known as jaggery, or more rarely, is purified into palm candy sugar. The boiling of palmyra sap is thus an important industry consuming large quantities of fuel of small dimensions, below 6 inches girth, as the larger sized fuel is useless for the purpose, a quick hot fire being the principal desideratum.

76. *Mats*.—Mats of varying degrees of coarseness (the maturer the leaf the coarser the mat) are made from palmyra leaves in large quantities both for export and local consumption. Excellent mats of *korai* grass are manufactured, mostly by Muslims, the price varying from Re. 1 to Rs. 35 per mat according to the texture.

77. *Small timber*.—The small timber that the Government forests supply, judging from the contractors accounts of removals for the decennium 1923–32, amounts on an average to about 1,500 tons per annum. The demand is estimated to be in the vicinity of 5,000 tons per annum. The balance has been met principally from the adjoining Travancore State and the Zamin forests, and to a lesser extent from the extensive patta lands of the Nanguneri mutt in Nanguneri taluk and the Tiruvaduthurai mutt in Tenkasi taluk. Owing to unrestricted cutting and felling under too short a rotation (10–15 years) the supply of small timber from the Zamin forests is likely to disappear in two or three decades. The necessity for conserving and extending our resources in this respect is indicated.

78. *Fuel*.—The fuel requirements of the division are very large. Mr. P. M. Lushington as a result of personal investigations in 1919 estimated the fuel consumption to be in the neighbourhood of 200,000 tons per annum. The village and rural demand is comparatively insignificant as the ryots use mainly palmyra, cotton and castor stalks, palmyra leaves, cowdung cakes and such brushwood fuel as is obtainable on village grazing grounds. A common agricultural custom of the ryot in the plain taluks deserves mention. Where the soil is too poor to yield an annual crop, the ryot after harvesting his crop, pens sheep and goats fed on *Acacia planifrons* pods on the land. The passage of the seed through

the alimentary canal of these animals, appears to have a remarkable effect on its germinative capacity. The dung mixed with seed which is obtained, is broadcast on the ploughed ground and if the rainfall is propitious, a crop of young seedlings soon results. This is carefully guarded from goats, etc., and within 6–8 years the plot is felled over and recultivated with field crops. The fuel from this source forms a valuable supplement to agricultural income, besides improving the fuel supply of rural areas which have been denuded of practically all natural tree growth. Again there are a number of areas scattered over the plains, chiefly tank-beds, over which under the provisions of rules framed under section 26 of the Madras Forest Act, the Forest Officer exercises a very limited control. These areas, some 18,000 acres in extent, known as "Unreserved lands" are under the direct control of the revenue authorities. The chief growth consists of babul (*Acacia arabica*), the wood of which is in great demand for fuel and agricultural implements. No restriction of grazing is enforced in these areas, and this combined with the fact that babul does not coppice, has resulted in the progressive destruction of this important fuel resource in the plains. The revenue from this source which averaged Rs. 15,000 per annum in the eleven-year period 1885–86 to 1895–96—has now dropped to an average of Rs. 1,160 per annum for the decennium 1923–1932.

It is only from the villages situated near the hills that women, and less often men, go and spend their time in the fuel coupes collecting fuel on payment to the contractor of seigniorage varying from 3 pies to 2 annas a head-load according to the quality of the fuel and the demand. It is the policy of the Forest department to distribute fuel coupes as widely as possible with the object of bringing cheap fuel to the ryots' door.

The larger fuel in the more remote fuel series is usually converted into charcoal *in situ*, for which there is a keen demand. From the fuel series situated within economic distance of the railway, the larger fuel is transported to the big towns, Tinnevelly and Palamcottah consuming some 40,000 tons of which Government forests supply only about 5,000 tons. The contractors of the fuel series situated in the northern part of the division, namely, the Puliangudi, Karuppusamikoil and Vasudevanallur Series in Kuttalam Range and Ayyanarkoil Series in Srivilliputtur Range, find it more profitable to transport their fuel to Madura by rail for sale.

As far as small timber and fuel is concerned it will be seen that no one, least of all Government, possesses the monopoly of supply, and market rates are consequently low. The fuel problem reduces itself therefore to a question of economics. There is always a demand for fuel which can be extracted at a rate below the prevailing market rate, over which we have no control.

79. *Timber.*—Big timber for constructional work is largely obtained from the Travancore State forests by rail through the Shencottah pass, and by road through the Achenkoil and Aramboli passes. Teak, *Hopea parviflora*, *Dalbergia latifolia*, *Dipterocarpus bourdilloni*, *Adina cordifolia*, *Mangifera indica*, *Artocarpus hirsuta* and *Vitex altissima* are the principal timbers exported. The annual output of the Shencottah division of the State Forest department, as far as evergreen timber is concerned can be judged from the current year's working (1932–33).

	CUBIC FEET.
Hopea parviflora	76,000
Dipterocarpus bourdilloni	82,670
Miscellaneous species	17,000
Total	1,75,670

Favourably situated as this division of Travancore State is, right on the Tinnevelly frontier, more than 75 per cent of its annual output is sold to merchants from the Tinnevelly, Ramnad and Madura districts.

A certain amount of timber, mainly "jungle wood" is supplied principally to the sea ports of Tinnevelly from the west coast, the transport being effected by native craft.

Burma teak enters the Tinnevelly division at Tuticorin and is largely used for the best constructional work, being conveyed by rail to most of the principal towns in the district. The quantity of such timber imported for the triennium 1928–29 to 1930–31 is given below:—

	CUBIC FEET.
1928–29	69,20(
1929–30	107,600
1930–31	84.85(

Besides this, there is a vast and annually increasing output of teak poles from the thinnings of the Travancore State teak plantations which were 10,672 acres in extent in 1930–31, and are increasing at the rate of approximately a square mile per annum. The felling of the final crop has not yet been started, the oldest crop being now about 65 years old and the tentative rotation 70 years. The decision of the State, repealing the statute declaring teak and rosewood "Royal trees," from 16th August 1941, has resulted in the concentration of the State Forest Department's activities on the extraction of all exploitable trees of these species found on private holdings, on a regular plan. The result has been over production and a consequent fall in the prices of these valuable timbers in the markets of the division. The people have a strong prejudice, consecrated by centuries of usage in favour of teak, and with the fall in prices of this timber the difficulty of marketing our lesser known and less durable evergreen species at a profit has been increased. The only big timber which the division can supply is evergreen timber, both the rainfall and soil conditions prevailing over most of the forests not being conducive to the production of big timber of deciduous species. The local demand for evergreen timber has been estimated by various Forest Officers to be about 10,000 cubic feet. Investigations made into the demand point to a much higher figure, namely, 40,000 cubic feet for the Kallidaikurichi market alone. Here again the crux of the problem lies in economic working. If extraction costs are kept below the prevailing market rates which are governed principally by the output of the Shencottah State forests and Singampatti Zamin, there would be no difficulty in disposing of the whole of the output under this plan.

80. *Sandalwood.*—Up to date, following the prescriptions of Mr. George Venugopal's tentative working plan, only dead trees and trees broken by elephants have been extracted from the Alagarkoil valley of Srivilliputtur Range under the Sandalwood Extraction Rules, the mean annual yield being in the vicinity of 3½ tons. Extraction was started in 1923–24 but unfortunately the work was not done in accordance with the Sandalwood Extraction Rules, till 1930–31. A list of dead sandal trees in girth classes extracted from the Alagarkoil valley is given below, for the years 1923–33, as far as statistics are available :—

Year.	Girth class. 0″—6″.	6″—12″	12″—18″.	18″—24″.	24″—30″.	Total.	Total yield of final cleaned wood. TONS.	QRS.	LBS.	OZ.
1923–24	..	..	..	..	..	110	..	62	4	8
1924–25	10	39	21	1	..	71	..	49	10	8
1925–26	..	..	..	..	..	98	..	63	12	0
1926–27	..	..	..	..	..	295	1	68	1	..
1927–28	..	..	..	..	..	169	1	16	18	12
1928–29	..	..	..	..	..	..	..	65	8	8
1929–30	..	..	..	..	..	331	4	32	4	14
1330–31	1	235	185	31	4	456	4	3	5	..
1931–32	9	600	344	36	1	990	8	18	24	..
1932–33	73	813	329	43	4	1,262	10	66	15	8

All the sandal extracted in the division is final cleaned and sent to the Tiruppattur sale depot where it is auctioned along with the Vellore sandalwood. The local demand, mainly for religious ceremonies and household use is met by private merchants who import the wood *via* Tuticorin from Bombay. This sandal is mainly Australian, and the billets are beautifully cleaned and polished. Although it is inferior to Indian sandal in scent and oil content, it is bought wholesale at Rs. 1,260 per ton and sold retail in Tuticorin at 1,344 per ton. The annual imports of this wood into the port of Tuticorin are given below :—

	Weight. TONS.	CWT.	LB.
1922–23	32	16	28
1923–24	18	5	84
1924–25	44	4	56
1925–26	41	14	0
1926–27	26	3	40
1927–28	39	8	84
1928–29	41	15	28
1929–30	32	12	56
1930–31	25	15	28
1931–32	18	0	56

The average annual imports amount to 32 tons. The annual demand in Tuticorin is about 2 tons, in Palamcottah and Tinnevelly about 4 tons, the rest of the division taking, according to the sandalwood merchants, about 2 tons. The greater quantity of the imported sandal is sent to Trichinopoly and Madura, where it is used both for *bona fide* religious and domestic purposes, and for illegal purposes, such as adulteration of the sandal illicitly abstracted from the reserved forests of the South Salem division. The need for exercising the greatest circumspection in the registration of property marks and the grant of way permits is indicated.

There is some sandal in the patta lands adjoining the reserves in Srivilliputtur and Kuttalam Ranges. Neither its distribution nor its value call for special comment. The local pattadars do not seem to set much store by the sandal on their holdings and none of it is extracted for commercial purposes. The Sembaga tope, an area of about 300 acres at the mouth of the Alagarkoil valley in Srivilliputtur Range, is owned by the Srivilliputtur Temple Trustees, and contains an excellent growth of young sandal, sample enumerations disclosing the presence of about 8–10 trees per acre about 6 inches girth. Extraction here is being done on a very small scale for the purpose of supplying the needs of the temple only. Although this crop is immature, the sandal is spreading rapidly and in time should be valuable.

The position in this division as regards patta sandal is quite different from that in other divisions, for example, North Coimbatore, as Government here has no right whatsoever to any of the sandal on patta lands. As the quantity available is small and as much of the regeneration is periodically destroyed by burning by the pattadar, who is seemingly unaware of its value, the rapid spread of the sandal on patta lands is not probable; moreover the difficulty of enforcing any "agreements" will be great, since in this division such agreements will be unilateral (unless consideration is paid at the time of execution of the agreements) and therefore unenforceable by law. Adequate control over patta sandal working can be obtained by having recourse to the Sandalwood Transit Rules (Appendix III), recently introduced in the division. In addition to this, it will be prescribed that attempts be made to induce pattadars to sell their dead sandal to us for extraction—vide paragraph 532 below.

81. *Bamboos.*—Bamboos form quite an insignificant proportion of the crop in the division. There is a great demand for this product, especially in the large towns, for erection of scaffoldings, pandals, fences, etc. Of recent years Messrs. Harvey & Co., have started using bamboo slats experimentally, for packing their cotton for export, and an extension of the demand may be anticipated. The supply at present is almost wholly met from the Travancore State forests; and therefore, favourably situated as many of our reserves are from the point of view of extraction, the artificial introduction of bamboo in suitable areas seems desirable. In this connexion it should be borne in mind that the bamboo is a comparatively cheap product; hence it should be introduced only in localities where transport facilities permit of low extraction costs. The introduction of *Dendrocalamus strictus*, is not favoured as the optimum elevation for this species 2,500 feet–3,000 feet, would preclude its introduction in localities from which it could be profitably extracted. *Dendrocalamus brandisii*, however has been successfully raised at elevations 5–600 feet in the Wynaad division and its experimental introduction in this division in favourable localities is desirable. *Bambusa arundinacea* has been grown in the division at elevations varying from 300 feet to 1,200 feet, although on a comparatively small scale, and the extension of such plantations as are economically situated will be prescribed.

82. *The Eta reed.*—This produce is at present worked sporadically through the agency of minor forest produce contractors, who issue head-load tickets for its extraction from any locality in their respective farms where it occurs. This method of extraction touches only an insignificant proportion of the vast reed areas in the division, only the most easily accessible areas being worked. The annual amount extracted is about 70 tons. Enquiries made into the possibility of working the more easily accessible areas by the system of located fellings by coupe contractors, have definitely pointed to the fact that there would be no demand for such coupes. The reed is of potential value as a source of paper pulp, and since details as to the best method of working it on the basis of a sustained yield would be valuable, in case the development of hydro-electric schemes provides a cheap source of power and make the establishment of paper mills possible, such details as are available as given below:—

Area.—As a result of stock mapping done by the Forest Engineering Branch in 1925–26, 28 square miles of reed jungle of which 17 square miles consisted of pure reed and 11 square miles of mixed reed and tree growth, were located in Ambasamudram Range. The latter was estimated to contain 60 per cent reed growth. Thus the total reed area available amounts to $17 + (\frac{11 \times 60}{100}) = 23·6$ square miles or about 15,100 acres.

Method of working.—Sylviculturally, clear-felling of the reed was found experimentally to be detrimental to its regeneration. The following statement

illustrating this, shows the results of experiments made by the District Forest Officer in 1925 :—

Original reed growth	Date of observations. March 1925.	June 1925.	March 1926.
Plot A— Half acre—Thick, with large sized culms and few trees.	Clear felled ..	Regeneration fair.	Shoots less than 5 feet high and 1 inch in girth. All shoots short, many broken by elephants.
Plot B— Half acre—Poor, culms small ..	Do. ..	Regeneration poor.	Regeneration dense, shoots less than 3 feet high.
Plot C— Half acre—Same as plot A ..	60 per cent the culms in each clump felled.	Regeneration good.	Except for the presence of new culms the clumps in this plot show no signs of exploitation : new culms 3 to 3½ inches in girth and about 15 feet high.

N.B.—The plots were near Kalavelipil in Ambasamudram Range.

The following details derived from enquiries made by Mr. A. Wimbush in 1925 in Travancore are also illuminating, and to some extent corroborative :—

(1) Clear-felling of reeds is fatal to the maintenance of a sustained yield. It is considered that if a clump is clear felled it will have to be left alone for seven years in order to recover.

(2) Provided that a sufficient number of culms are left to feed the rhizomes, a felling cycle of four years is probably sufficient.

(3) The smothering of cut-over clumps by the refuse from felling is to be deprecated, but the only District Forest Officer consulted on the point thought that burning of the debris would be much more injurious.

Exploitation.—In order to test the utility of this reed for making paper pulp, 2 acres of pure reed jungle near Woods hut, were clear-felled departmentally in 1926, and the produce sent to the Forest Research Institute, Dehra Dun. The yield was 17½ tons of green weight or 11½ tons of air dried weight of reed. This gives an output of 5¾ tons of air dried reed per acre under clear-felling or an yield of 3½ tons of air dried reed per acre if only 60 per cent of the crop is felled. It must be added that all top ends, leaves and branches have been excluded from these calculations. On this basis the reduced area of 15,000 acres, represents a total yield of 52,500 tons of air dried material. Under a felling cycle of three years the annual yield would be 17,500 tons. According to the Paper Pulp Expert 2 to 2½ tons of air dried reed would be required for a ton of paper pulp. Taking the higher figure therefore, the supply is sufficient for manufacturing 7,000 tons of paper pulp annually. The total cost of extraction and supply to rail head (Ambasamudram) amounted to Rs. 111 per ton air dried weight. As the reed had to be supplied at short notice, the work of extraction could not be well organized or controlled. The District Forest Officer at the time, held the opinion that with proper organization the cost of delivery at Ambasamudram could be reduced to Rs. 85 per ton, with the existing methods of transport.

Under the direction of Mr. Raitt, the officer in charge of the Paper Pulp section at Dehra Dun, the reed sent from the division was converted into paper. He was of opinion that the reed made first-class paper pulp, yielding a fibre of exceptional length and slenderness, i.e., softness and felting quality. It was suitable for any grade of high class art printing and litho paper, being exceptionally free from dirt and matter producing objectionable specks on the paper. The cost of manufacture per ton of paper was :—

	RS.	A.	P.
(1) Chemical process	20	8	0
(2) Bleaching	21	0	0

Mr. Raitt suggested that if a mill was erected at Mundanthorai about 10–12 miles from the reed areas in a straight line, the dry reed could be delivered at the mill at Rs. 15 per ton with the assistance of ropeways. Thus, on the basis of 2½ tons of dry reed to 1 ton of paper, the cost of the reed would be Rs. 37–8–0 per ton of paper. There was a prospect therefore the cost of raw material and chemicals up to the bleached pulp stage amounting to only Rs. 79 a ton, a figure which was not approached by any other raw material in the world. (The corresponding figure for the grass which is the staple for North Indian paper makers is Rs. 200 per ton and for the bamboo mills Rs. 160 per ton.)

Since the reed was a patch flowering species and was not known to flower gregariously the question of stoppage of supplies during a general seeding did not arise.

This satisfactory report by an expert who was universally known to be an authority on the subject, interested a number of European firms in the subject. Messrs. John Dickenson & Co., Ltd., may be quoted as an example; they stated their case as follows :—

(1) The scheme was highly speculative and not sufficiently attractive unless Government was prepared to share the risk.

(2) The location was poor for a paper factory being very far from principal markets.

(3) Hence before considering the scheme further, the company would like to know if the Government were prepared to—

(*a*) construct power installation and provide power service to the factory at a low rate;

(*b*) grant a concession for the rights to cut and remove the reed on a seigniorage of Re. 1 per ton of dry material;

(*c*) contract to take a proportion of the factory output of not only paper, but envelopes, bags, account books, etc.;

(*d*) obtain railway freight concessions; and

(*e*) guarantee a certain interest on the investment, say $3\frac{1}{2}$ per cent until the factory had reached a profitable stage.

In return for these concessions the company was prepared to erect a mill capable of utilizing 4–5,000 horse-power of electric energy with an approximate outturn of 5,000 tons of paper per annum.

The Chief Engineer, Hydro-Electric Division, reported that the consumption of 5,000 horse-power only of electrical energy would not justify expenditure on the hydro-electric scheme. Attempts were then made to attract the attention of the cellulose and artificial silk interests to the scheme, with the idea of increasing the demand for power, but these met with no success. The scheme was therefore dropped on the advice of the Chief Forest Engineer as "not being commercially feasible at present." The preliminary investigation into the various ropeway, railway and flume transport schemes, carried out by the old Forest Engineering branch at considerable expense, proved disappointingly unproductive. The Chief Forest Engineer's Dis. No. 6153 of 1927, contains :—

(*a*) The survey of meter gauge railway from Ambur to Mundanthorai and proposed dam site with an extension to Kodamadi.

(*b*) Survey of main flume from reed areas to proposed impounded lake near Taravittanparai and one branch flume tapping the western portion of reed area.

(*c*) Maps of proposed ropeway routes and flume routes.

(*d*) Reconnaissance maps of Singampatti and Kalakad forests showing reed areas. All these details being now merely of academic interest are not embodied in this plan, but are filed in the Forest Engineer's office.

83. *Manure leaf.*—The removal of manure leaf from the forest on payment of 2 annas 6 pies per head-load is permitted only in the Nanguneri and Srivilliputtur Ranges. It is rather surprising that although the wet cultivation in the plains in the Ambasamudram and Kuttalam Ranges is even more extensive than that in the plains in the neighbourhood of the reserved forests of Nanguneri and Srivilliputtur, yet manure leaf removal is prohibited in the former, while it is allowed in the latter ranges. Since many of the ryots in Nanguneri and Srivilliputtur have started growing their own manure leaf—kolinji (*Tephrosia sp.*)—under the aegis of the Agricultural department, a proposal was put forward by the District Forest Officer in 1930 to enhance the rate for manure leaf to 4 annas per head-load from 1931, so as to compel the ryot to grow increasing quantities of his own manure leaf and to rely to a diminishing extent on the forest supply. This proposal was supported by the Collector of Tinnevelly, but the Collector of Ramnad, while accepting the principle involved, considered it impolitic to raise rates at a period of acute agrarian distress. The Chief Conservator of Forests agreed with the Collector of Ramnad and ordered that the proposal should be held in abeyance until agricultural conditions improved. The cultivated manure leaf, kolinji is at present sold at Rs. 12 a cart-load. With agricultural labour available at 4 annas per diem the cost of one cart-load or 20 head-loads of manure leaf from the forest would be only Rs. 8 even on the assumption that a labourer can harvest only one head-load of such manure leaf per diem. It is obvious that the ryot has little or no incentive at present to grow his own leaf manure. Two alternatives are open to us. The first is to raise the rate for manure leaf from the reserves to 4 annas per head-load immediately. This will not only bring the price of the leaf more in line with its market value, but also serve as an incentive to the ryot to increase cultivation of his own manure leaf. The second alternative is the application of closure of the reserves to manure leaf removal, after perhaps a year's notice in the District Gazette. While immediate prohibition of removals would probably cause hardship to the ryot and possibly result in the demand being met illicitly by collusion with forest subordinates, the raising of the rate to 4 annas per head-load would, on the other hand, do good both to the forest and ultimately to the ryot, in that the latter would be compelled to grow his own supply. Unfortunately the damage to the forest cannot be localized by the prescription of leaf manure felling series, as practically the whole of the outer slopes containing tree growth have been constituted into fuel felling series, and the ryot would find it uneconomic to go beyond the fuel series for his supply owing to the distance and the relative absence of the kind of leaf manure that he requires.

84. *Grazing.*—The forests above approximately the 1,500 feet contour are very steep and consequently not suited for grazing either from the point of view of the grazier or of the Forest Officer. They are covered with shola forest, thin semi-deciduous forest or tall coarse grass; this latter provides grazing of poor nutritive value but is rarely eaten by cattle; if burnt however, a crop of tender shoots is soon produced which is quite palatable to cattle. In the interests of the preservation of the water sources on which the irrigation in the plains depends, it is essential to protect such areas from fires; this can be accomplished only by prohibiting grazing in such areas.

The forests below 1,500 feet are for all practical purposes, the only areas from which the pastoral requirements of the people can be supplied; owing to the keen demand for fuel, small timber and charcoal, the fuel coupes give an average annual revenue *per acre* varying from 8 annas in Kolunthamamalai Felling Series to Rs. 2–7–0 in Kuttalam Felling Series. If it is admitted that the grazing of half a cow unit per acre per annum would practically mean the destruction of the whole forests in time, it seems much the same as saying that the Forest department are charging 4 annas per acre for what they might legitimately charge at least Rs. 1–8–0.

The following table shows the various grazing compartments into which the forests are at present divided, together with an approximate estimate of the area available in each compartment for grazing. This estimate has been arrived at by excluding all areas over the 1,500 feet contour (as such areas are seldom if ever visited by cattle) and areas closed annually to grazing for sylvicultural reasons or for the protection of bison.

Name of compartment.	Actual area.	Area closed annually.	Area inaccessible.	Area available for grazing.
	ACS.	ACS.	ACS.	ACS.
Srivilliputtur Range—				
Ayyanarkoil	8,128	924	2,797	4,407
Valaikulam	1,530	470	...	1,060
Mamsapuram	3,000 }	448	1,299	4,397
Rangarkoil	3,144 }			
Rangathirthum	3,253	...	99	3,154
Pudupatti	5,535	630	1,860	3,045
Khansapuram	2,396	...	...	2,396
Chittar	5,886	...	5,288	598
Total ...	32,872	2,472	11,343	19,057
Kuttalam Range—				
Kuttalam, west	1,691 }	775	326	1,632
Kuttalam, east	1,234 }		192	
Mathalamparai	1,681	...	672	1,009
Pumbli	506 }	473	134	624
Vadagarai	815 }		90	
Chinnakadu	1,389 }	..	877	1,318
Palayar	1,852 }		1,046	
Krishnapuram	3,207	342	2,017	848
Puliangudi	2,705	669	51	1,985
Karupasamikoil	2,953	677	672	1,604
Vasudevanallur	2,957	769	844	1,344
Puliangudi Hill	3,346	...	3,160	186
Vasudevanallur Hill	4,635	...	4,552	83
Total ...	28,971	3,705	14,633	10,633
Ambasamudram Range—				
Koilteri	2,375	542	75	1,758
Aladiyur	3,000	...	90	2,910
Vikramasingapuram	2,998	312	20	2,666
Ambur	2,800	418	...	2,382
Sivaiselvam	3,000	...	758	2,242
Kadayam	2,000	...	683	1,317
Govindaperi	3,200	...	666	2,534
Padaramalai	3,993	...	180	3,813
Total ...	23,366	1,272	2,472	19,622
Nanguneri Range—				
Kolunthamamalai	2,781	341	76	2,364
Vadagarai	12,500	3,487	5,917	3,096
Kalakad	7,590	932	3,664	2,994
Malayadipudur	5,000	186	2,797	2,017
Parivarisurian	7,975	2,641	3,770	1,564
Nambikoil	3,560	...	2,769	791
Mudalurappan	5,260	...	5,209	51
Total ...	44,666	7,587	24,202	12,877
Srivaikuntam Range—				
Vallanad	2,150	498	...	1,652
Manakkarai	2,937	...	...	2,937
Total ...	5,087	498	...	4,589

85. *Grazing incidence.*—The total effective grazing area in each range, and the average incidence for each range as calculated from the average grazing revenue for the decennium 1923–24 to 1932–33 are given below:—

Range.	Effective grazing.	Average annual grazing revenue.			Incidence in acres per cow unit.
	ACS.	RS.	A.	P.	ACS.
Srivilliputtur	19,057	3,145	3	0	3·06
Kuttalam	10,633	2,341	7	0	2·27
Ambasamudram	19,622	1,423	0	0	6·89
Nanguneri	12,877	2,175	6	0	2·95
Srivaikuntam	4,589	636	10	0	3·60

The effect of the closure of grazing compartments owing to fire has not been considered in the above statement. This would further increase the incidence. It will be noticed that the incidence varies from 2·27 to 6·89 acres per cow unit, the average for the division being 3·43 acres per cow unit, which is undoubtedly high from the point of view of conservation and the development of the fuel and small timber resources of the division. The Forest Officer, interested as he is in these two objects, should view the decline in the grazing revenue with perfect equanimity provided it is not due to slackness or venality on the part of subordinates; a reduction in the grazing incidence would considerably enhance the future value, both direct and indirect of the forests, and ultimately be of great benefit to the ryot. The raising of the grazing fees would result in such a reduction in a much shorter time, but is not advocated, as it would contribute towards increasing the prevailing agrarian distress, besides being opposed to the declared policy of Government. The distribution of the incidence more evenly over the effective grazing area is however desirable, and to attain this object, penning, under suitable safeguards against fire, in such of the hill grazing compartments as are in demand, will be prescribed.

86. *Stall feeding of cattle.*—The practice of feeding cattle with cut fodder from the reserves is practically unknown in the division save in times of scarcity of famine. Neither the inferior breed of cattle raised, nor the resources of the ryot, would justify expenditure on stall feeding. It is only the plough bull which is stall fed at present, the vast majority of the cattle being left to eke out a precarious living from the limited village grazing grounds, the unassessed waste lands, dry tank beds and other places where grazing is free. Such of the cattle as go to the reserves cannot benefit very much from their excursion. They are driven to the forest, 2-5 miles away from the village, so as to reach it at about midday and after a couple of hours grazing or so, during the hottest part of the day, are driven back to the village for watering in the evening. The result is that while the cattle get plenty of exercise they get little nutrition, and their manure is definitely lost to the fields. With a view to encourage stall feeding it appears desirable to permit the free removal of fodder grass (at present an item of minor forest produce) under adequate control.

87. *Improvement of fodder grass.*—The important question of improving the fodder grass in the division has not received the attention it deserves. This is partly due to the fact that most of the more easily accessible forest on the outer slopes has been constituted into fuel felling series, and it is the policy of the department that areas set apart for the production of fuel or timber should not be utilized for the artificial propogation of grass. The Kudiraimozhi Teri Reserve is a large sandy waste, the partially reclaimed portions of which would be ideal for the experimental introduction of tropical grasses. Situated as it is close to the Tiruchendur-Palamcottah branch of the South Indian Railway, it would increase enormously in value if clothed with grass, which would not only serve the purpose of fixing the sands, but also provide grazing for local cattle and perhaps serve in time as grass farm from which grass could be annually harvested and transported for sale throughout the division. The grass *Pennisetum cenchroides* was introduced in 1932 on an area of 2 acres in the Nazareth series but the experiment was a failure, largely because the grass was sown towards the tail-end, instead of at the first burst, of the north-east monsoon. If the experiment be persevered in under better auspices there is little doubt that it would be successful. The fact that the whole of the Teri reserve is closed to grazing is an additional advantage.

88. *The grazing year.*—The grazing year is at present synonymous with the fasli year, starting from 1st July. This is because the demand for grazing begins only in July, by which time the south-west monsoon has already burst on the hills. The fallow fields and tank beds where the village cattle normally find their grazing are no longer available, as the former are under cultivation and the latter are usually filled with water. No change in the present arrangement is advocated, as it is not only long established in the division, but also is eminently suited to local conditions.

89. *Closure to grazing.*—The present policy is to close areas to grazing after bad fires, mainly to enable the damaged tree growth to recover by removing the temptation to the grazier to reburn the area. There is little doubt that the majority of the fires in grazing areas are due to the incendiary activities of graziers who attempt to destroy the tall coarse grass present in such areas by fire, in order to obtain the luscious young shoots which appear in the burnt area immediately after a little rainfall. To be of value sylviculturally and also as a deterrent measure, closure should be prompt and effectively enforced. Cattle do appreciable damage to fire coppice and seedling growth; besides they loosen the exposed soil by trampling and thus render it more liable to erosion by rain, a matter of considerable importance in this division where the bulk of the forests are situated on steep slopes. At present much delay is caused before closure can be applied as the Collector's sanction is necessary. The delay is fatal both sylviculturally and as a deterrent measure. The only way to remedy this state of affairs is to empower the District Forest Officer to order closure himself up to 1,000 acres subject to the proviso that any action taken by him be reported forthwith to the concerned Collector within ten days.

90. *Minor forest produce.*—All minor forest produce is extracted through the agency of contractors, the right to collect it being sold annually in auction by farms for the fasli year beginning 1st July. The following table contains an abstract of the total quantity in quarters, of various items extracted in the division, according to contractors' accounts, for the years 1923–24 to 1931–32. The botanical name of most of the items has been verified as far as possible, but the need for verification with botanical specimens is emphasized. The conversion factor adopted is 1 headload equals 56 lb.

English or vernacular name. (1)	Botanical name. (2)	Portion used. (3)	1923–24. (4)	1924–25. (5)	1925–26. (6)	1926–27. (7)	1927–28. (8)	1928–29. (9)	1929–30. (10)	1930–31. (11)	1931–32. (12)
1 Achanpallam	*Cudrania javanensis* ..	Fruit ..	..	..	..	8	..	..	..	..	..
2 Alangikai	*Alangium lamarckii* ..	Do. ..	6	34	..	60	..	..	..	..	..
3 Alapanni	*Arenga wightia* ..	Leaves and	34	..	288	42	30	5	..	30	132
		flowers.	..	..	..	98	..	1	..	..	26
4 Athikai	*Ficus sp.*	Fruit ..	..	..	..	..	..	4	..	..	6
5 Avaram	*Cassia auriculata* ..	Bark ..	34	808	..	..	..	232	1,150	850	1,206
6 Bees wax and honey ..	....	..	..	..	208	936	..	14	24	4	5
7 Boonthikottai ..	....	Seed ..	..	..	..	..	78	..	..	..	..
8 Cardamoms	*Elettaria cardamomum* ..	Fruit ..	966	282	494	256	580	371	89	141	185
9 Cashewnuts	*Anacardium occidentale* ..	Do. ..	..	..	..	..	86	6	28	114	421
10 Coconut	*Cocos nucifera*	Do. ..	..	..	..	..	2	28	..	..	10
11 Coffee	....	Do. ..	6	..	..	..	..	..	..	..	4
12 Creepers	....	..	260	2,064	1,962	1,008	2,082	1,618	1,980	758	1,276
13 Elandaikai	*Zizyphus jujuba* ..	Fruit ..	..	202	600	1,408	..	..	..	380	1,082
14 Garudakodi	....	Do. ..	..	..	2	40	46	..	..	382	12
15 Ginger	*Zingiber cassummunar* ..	Tuber ..	..	14	6	..	26	6	..	18	..
16 Grass (thatch) ..	....	..	35,350	70,096	45,796	60,356	71,160	20,880	25,639	52,459	64,515
17 Grass (fodder) ..	....	..	..	..	..	..	..	..	1	766	1,654
18 Gravel	....	..	..	9,080	680	..	..	..	..	13,880	12,840
19 Illupai	*Bassia latifolia* ..	Fruit ..	..	..	12	..	..	..	..	..	..
20 Indukodi	*Acacia intsia*	Bark ..	988	170	380	..	426	394	299	1,061	1,102
21 Indunar	*Acacia intsia*	Fibre ..	..	..	..	..	..	60	..	..	..
22 Inju	*Phoenix sp.*	Fruit and leaves.	..	70	158	1,284	996	144	244	256	992
23 Itakalli	*Ochlandra sp*	Seed ..	3,014	2,746	3,128	6,592	3,266	5,032	6,168	11,737	7,390
24 Jack	*Artocarpus integrifolia* ..	Fruit ..	66	258	..	462	1,476	245	278	278	249
25 Kadukai	*Terminalia chebula* ..	Do. ..	252	568	322	1,150	4,614	573	3,124	1,742	571
26 Kanakamugu ..	*Pinanga dicksonii* ..	Fruit and leaves.	..	..	122	240	206	47	118	87	76
27 Kanjurankottai ..	*Strychnos nuxvomica* ..	Seed ..	..	..	..	40	..	..	..	..	..
28 Kandapanai	*Bentinckia coddapana* ..	Fruit ..	..	..	..	..	..	..	..	..	14
29 Karuthativer ..	*Sida rhomboidea* ..	Fibre ..	..	..	..	..	..	..	..	..	46
30 Karuveppillai ..	*Murraya Kœnigii* ..	Leaves ..	1	..	130	42	6	62	..	4	27
31 Kathalai	*Agava sp.*	Fibre ..	..	..	..	2,822	..	2	..	80	70
32 Kattujadikai ..	*Myristica sp.*	Fruit ..	..	..	384	..	..	..	..	..	82
33 Kelakai	*Carissa carandas* ..	Do. ..	4	242	774	1,720	286	8,718	864	258	670
34 Kodivaliver	*Tinospora cardifolia* ..	..	..	112	142	..	60	18	192	19	238
35 Kollankorai kilangu ..	*Corallocarpus epigœa* ..	Tuber ..	..	..	..	..	..	..	..	4	..
36 Koovai	*Curcuma angustifolia* ..	Leaves ..	..	222	46	640	764	176	261	430	699
37 Koovaikilangu ..	Do. ..	Tuber ..	..	..	458	..	..	..	..	8	48
38 Kovanji	*Solanum sp.*	Fruit ..	..	..	..	..	..	..	..	..	1
39 Korai grass	*Cyperus rotundus* ..	..	166	202	518	882	408	451	264	539	737
40 Kunthrikam	*Canarium strictum* ..	Dammar.	378	168	384	494	536	42	138	208	22
41 Lavangapatti Shannalavangam.	*Cinnamomum gracile* ..	Leaves and bark.	..	40	160	112	60	22	93	8	79
42 Mangoes	*Mangifera india* ..	Fruit ..	..	54	..	2	3	..	..	..	70
43 Manjanathi	*Morinda tinctoria* ..	Bark ..	..	..	..	..	..	1	..	..	[illegible]

English or vernacular name.	Botanical name.	Portion used.	1923-24.	1924-25.	1925-26.	1926-27.	1927-28.	1928-29.	1929-30	1930-31.	1931-32.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
44 Muduchikai	*Buchanania latifolia* ..	Fruit ..	..	..	..	..	..	14	..	..	..
45 Mullikai	*Solanum indicum* ..	Do. ..	8	..	..	..	..	86	248	12	14
46 Nangu	*Messua ferrea* ..	Seed ..	..	..	..	..	..	..	18	50	80
47 Nannariver	*Hemidesmus indicus* ..	Root ..	..	..	..	4	..	..	4	..	..
48 Neikottai	*Sapindus emarginatus* ..	Fruit ..	..	..	..	12	18	..	..	..	..
49 Nellikai	*Phyllanthus emblica* ..	Do. ..	..	26	80	280	12	7	34	6	17
50 Nochi Nar	*Vitex negundo*	Fibre ..	..	..	..	..	..	..	..	..	1
51 Nongu	*Borassus flabelliformis* ..	Fruit ..	..	..	16	..	..	24	..	3	..
52 Odankodi	*Hippocrates indica* ..	Do. ..	..	..	..	..	..	..	..	250	2,398
53 Palankodi	*Toxocarpus kleinii* ..	Do. ..	..	..	..	..	..	9	8	30	18
54 Panaiolai	*Borassus flabelliformis* ..	Leaves ..	..	124	350	194	82	16	8	446	120
55 Plantain	*Musa sp.*	Do. ..	130	..	120	302	196	178	10	66	73
56 Poolathikodi ..	....	..	..	188	30	216	72	218	166	918	86
57 Pulukapattai ..	....	..	14	6	12	306	104	3	251	..	240
58 Rattan	*Calamus rotang* ..	Cane ..	2,230	860	682	1,248	1,234	668	3,914	2,521	2,777
59 Salapanaiolai ..	*Corypha umbra culifera* ..	Leaves ..	..	..	90	154	540	158	12	..	55
60 Saragapattai.. ..	*Cassia fistula*	Bark ..	..	..	..	..	..	..	..	..	10
61 Sayaver	*Oldenlandia umbellata* ..	Chay root.	..	..	12	..	..	..	..	..	..
62 Seegikai	*Acacia concinna* ..	Barb and fruit.	..	..	..	4	4	..	..	..	2
63 Selankoi	....	..	..	..	..	10	164	74	130	1	8
64 Senkottai	*Semecarpus anacardium.*	Marking	..	..	..	88	..	..	..	..	..
		nut.	380	41,240	2,306	10,600	1,890	4,480	11,080	48,040	32,440
65 Stone cut	....	..									
66 Stone rough	....	..	94	9,960	506	3,320	3,864	4,804	15,520	5,720	8,680
67 Sundaidai	*Solanum torvum* ..	Fruit ..	138	594	1,664	416	902	1,076	1,212	799	1,351
68 Tamarind	....	Do. ..	1,722	1,946	712	1,366	2,004	323	1,002	2,905	2,433
69 Tellukoi	*Entada scandens* ..	Do. ..	..	..	126	90	210	98	226	391	51
70 Tettankottai.. ..	*Strychnos potatorum* ..	Do. ..	..	..	..	10	92	5	..	..	..
71 Thalaipu	*Pandanus sp.*	Screw pine flower.	..	..	..	..	216	94	273	213	539
72 Thanikai	*Terminalia belerica* ..	Fruit ..	..	..	..	10	108	11	..	..	..
73 Vallamburikai ..	*Helecteres isora* ..	Do. ..	..	6	284	182	164	13	56	..	..
74 Vallikilangu	*Ipomœa digitata* ..	Tuber ..	..	14	10	4	..	6	..	..	..
75 Varthamkai	*Azadirachta indica* ..	Fruit ..	..	..	..	..	..	1	..	..	..
76 Vembadam	*Ventilago madraspatana.*	Bark ..	14	..	50	12	114	52	..	45	5
77 Vilankai	*Feronia elephantum* ..	Fruit ..	..	..	..	..	..	1	..	..	..

In addition to the list of products, enumerated above, the following items which find a place in the existing schedule of minor forest produce, but which do not appear to have been collected, may be included :—

(1) Kalmadam : *Buchanania sp.* (probably).
(2) Nervalam : *Croton tiglium.*
(3) Puvan seed : *Schleichera trijuga.*
(4) Oranges, lemons and pumiloes : Found in rest-house compounds.
(5) Guavas : Found in rest-house compounds.
(6) Punnamkottai : *Calophyllum inophyllum* seeds.
(7) Seenthi kodi : *Acacia pennata.*
(8) Kalpasi : *Stonemoss.*
(9) Vilvamkai : *Aegle marmelos.*
(10) Kullaipattai : *Grewia sp.* bark.

The inclusion of the shed horns of sambhur and cheetal stags, at present an item in the schedule, is not advocated as the Collectors frequently set fire to grass areas in order to find the horns more easily. In this division where game is comparatively scarce, the revenue sacrificed will not be incommensurate with the risk to the forest involved.

The prevailing system of dividing the ranges into farms bounded by natural features has much to recommend it, as small contractors are encouraged to bid at the sales and competition is stimulated. The prices obtained at the sales are usually fair as competition is keen and the system of sales long established. Therefore departmental collection is not recommended save in exceptional circumstances, e.g., where prices obtained at the sales for a particular product which can be easily collected, such as tamarind, are wholly incommensurate with the value of the produce as judged by previous year's prices and the current year's expectation of the crop.

SECTION 2.—MARKETS.

91. *Fuel and small timber.*—All the fuel and small timber produced in the Nanguneri and Ambasamudram Ranges is disposed of locally, the small timber being absorbed mainly by the rural and village population and the better fuel being sent to the big towns such as Tinnevelly and Palamcottah. The abolition of tolls on cart-traffic has given a great impetus to this method of fuel transport, which is now cheaper for distances below 30 miles than rail traffic. About 25 per cent of the fuel, charcoal and small timber produced in the Kuttalam and Srivilliputtur Ranges is sent to Madura for sale, the difference between the sale prices at this town and those prevailing locally more than covering the additional cost of transport.

92. *Evergreen timber.*—The big timber produced in the division is all evergreen timber. The difficulty of the terrain, the comparatively low value of this timber, the need for light extraction in order to preserve the essential character of these forests, have all contributed towards rendering expenditure on metalled roads unjustifiable. It is not possible therefore to extract logs, and only scantlings, such as boles 16 feet by 6 inches by 4 inches and half boles, kais 18 feet by 5 inches by 2 inches and half kais, and similar sizes, can be extracted, the timber being manhandled from stump site to road head, a distance which may be anything up to two miles. Most of the local demand for these scantlings is at present met from the Travancore State forests. It is with the idea of capturing a large portion of this trade and incidentally making the division self-supporting in respect of this produce, that the working of the evergreen forests is recommended.

93. *Sandal.*—All the sandal produced in the division is sent annually to the Tirupattur sale depot for sale. The need for meeting the local demand by establishing sale depots at all range offices and the District Forest office at Tinnevelly is emphasized.

94. *Minor forest produce.*—The minor forest produce collected in the division is all absorbed locally none of it as far as enquiries go, being exported.

95. *General.*—It will be noted that the division is at present far from self-supporting as far as the demand for forest produce is concerned. Prices are controlled by outside agencies, timber prices by the output of the Travancore State forests and the imports at Tuticorin; fuel prices, more or less, by the area exploited annually by the various

zamindaries and temple lands, scattered over the division. The zamindaries are particularly capricious in their annual yields, as felling is regulated not on the principle of a sustained yield but according to the present needs of each zamindar.

96. *Markets.*—The chief local markets for forest produce are—

Nanguneri Range—
- Tinnevelly.
- Palamcottah.
- Srivaikuntam.
- Tiruchendur.
- Tuticorin.
- Shermadevi.
- Nanguneri and Kalakad.

Ambasamudram Range—
- Ambasamudram.
- Kallidaikurichi.

Kuttalam Range—
- Tenkasi.
- Kadayanallur.
- Vasudevanallur.
- Sankarankoil.

Srivilliputtur Range—
- Srivilliputtur.
- Rajapalayam.
- Sattur.
- Watrap.

The only foreign market is Madura, which absorbs about 25 per cent of the outturn of fuel and small timber of the coupes in Kuttalam and Srivilliputtur Ranges.

SECTION 3.—LINES OF EXPORT.

97. *General.*—Both the Tinnevelly and Ramnad districts are supplied with an excellent net work of roads maintained by the respective district, taluk board and municipal authorities. Most of the roads in Tinnevelly district are so well maintained, as compared with those in the Ramnad district, that the motorist knows without being told that he has crossed the Tinnevelly-Ramnad frontier. This road system is reinforced by the following metre gauge railway lines of the South Indian Railway :—

(1) The Virudunagar-Tenkasi chord line, connecting the forests of Srivilliputtur and Kuttalam, with the big towns of the North Tinnevelly and Ramnad plains, and with Madura.

(2) The Tuticorin-Maniyachi branch line, connecting with the port of Tuticorin.

(3) The Tinnevelly-Tiruchendur branch line.

(4) The Tinnevelly-Virudunagar line.

(5) The Tinnevelly-Ambasamudram-Tenkasi line : available for the forests of Ambasamudram and Nanguneri Ranges.

98. *Forest roads.*—Forest produce is usually transported from the forest along rough fair weather cart-tracks, to the main public roads and thence either by road or rail to the important markets. The only metalled forest roads in the division are the Mundanthorai-Papanasam ghat road, 4½ miles, and the road connecting Kalakad village with Sivanaperi rest-house, about half mile. Since most of the fuel series are in their second rotation, and some in their third, expenditure on cart-tracks in a fuel coupe is restricted to the re-opening of such tracks as were used in the previous rotation. This comparatively small expenditure is cheerfully borne by the coupe contractor, who, it must be acknowledged, does the work far more cheaply and expeditiously than it could be done departmentally. Too little attention, however, has been paid in recent years, to the important point of assisting the contractor to bring his produce out of the forest. The excuse has been retrenchment, but it is no real economy, rather the reverse indeed, to allow our roads to get into disrepair, as not only will the subsequent cost of repairs be greatly increased, but the prices paid for forest produce will be correspondingly reduced. It also frequently happens that forest produce has to be conveyed from a particular coupe where the only road available belongs to a pattadar. The latter is usually reasonable, and some amicable settlement between the pattadar and contractor can be arrived at to the benefit of both parties. The pattadar however is sometimes unreasonable in his demands with the result that the contractor suffers loss and becomes increasingly reluctant to purchase such coupes. It is therefore to our benefit to arrange the details of extraction from every coupe, well in advance of the sales, and also to inform intending bidders at the time of sales what arrangements have been made to facilitate extraction. In case the pattadar proves recalcitrant, the Range Officer has only to make a show of starting land acquisition proceedings, to bring him to reason. The acquisition of every such cart-track under the Land Acquisition Act is not advocated, as some roads are useful only for one or two coupes and are therefore likely to be used only once or twice in a thirty-year rotation. The cost of acquisition would thus be wholly incommensurate with their value to us. Such roads as are likely to be of benefit for the working of a series of coupes however should be acquired, if other methods of bringing the pattadar to reason fail.

99. *The Serviar and Kariar crossings.*—The Papanasam-Kannikatty road crosses two unbridged rivers one at Mundanthorai—the Serviar and the other four and a half miles away—the Kariar. The existence of these two crossings over rivers which are very turbulent during the monsoons, considerably detracts from the value of the road, and the question of bridging either or both rivers has engaged the attention of almost every Forest Officer, who has been in charge of the division, since the working of the coppice coupes on the Mundanthorai plateau was firmly established. The project was examined by Mr. F. A. Lodge as early as 1905 and an estimate for Rs. 15,000 for the Serviar bridge prepared, it being found that even with the limited working then prevalent the bridge would pay handsomely for itself. In 1919 Mr. P. M. Lushington resuscitated the subject and believed that a bridge across the Serviar would cost at least Rs. 30,000 but was even more imperatively necessary then, to enable the successful working of the evergreen forests in Ambasamudram Range for fuel and timber, a project in which he was greatly interested. No real progress was however made till Mr. R. D. Richmond's visit to the division in 1932 when the investigation of the project by the Forest Engineer was ordered. The latter submitted an estimate for a three-span steel girder bridge across the Serviar at Mundanthorai for Rs. 27,100.

100. *Advantages of the project.*—The financial implications of the project may now be examined :—

(*a*) On the right bank of the Serviar we have the Padaramalai Fuel Series, the Kodamadi evergreen timber coupes, the Kariar and Kodamadi teak plantations, and the Kannikatty evergreen timber coupes, all of which would benefit from the construction of a bridge across the Serviar. The annual coupe in the Padaramalai Series is about 130 acres, and it now sells at Rs. 16 per acre though inferior coupes on the left bank of the river in the Koilteri series fetch Rs. 30 to Rs. 35 per acre. At a conservative estimate the bridge at Mundanthorai would result in an increase in revenue of Rs. 15 per acre or Rs. 1,950 per annum.

(*b*) The evergreen timber coupe of about 225 acres will be situated on the right bank of the Serviar for eight out of the ten years of the felling cycle. The annual yield will be in the vicinity of 30,000 cubic feet and if the increased transport facilities afforded by the bridge result in a saving on carting of 1 anna a cubic foot, an annual saving of about Rs. 2,000 would result.

(*c*) A greater revenue (difficult to forecast) for our teak regeneration areas at Kariar and the thinnings of teak plantations at Kariar and Kodamadi, would be obtained.

(*d*) The Kattalaimalai Estate would benefit considerably from the project and would in all probability consent to an enhancement of its annual contribution or to share the original cost.

101. *Disadvantages of the project.*—The following points however need careful consideration :—

(*a*) The Serviar is subject to sudden and violent floods, during which whole trees are washed down and this would be a serious menace to any bridge unless it had very high arches and a long span. The Kariar is even more turbulent in this respect and has changed its course at least twice in the last decennium, to the knowledge of the present generation.

(*b*) In case the Papanasam Hydro-electric Scheme adverted to in paragraph 82 above materializes the Mundanthorai bungalow as well as the proposed bridge site would be completely submerged. To risk a large capital expenditure on the project does not seem advisable.

102. *Conclusions.*—For these reasons the construction of stone causeways across both rivers is recommended. The expenditure on them would be considerably less and therefore the project could be financially better justified. Both rivers contain high water for only two or three months in the year during which practically no carting is done, as the fair-weather roads are not negotiable owing to the heavy rainfall. All that the cartmen desire is a surface, even enough to provide foot hold for their bulls, and grip for the cart wheels. A foot or so of water running over the causeway would not render it impassable. An investigation into the possibilities of constructing such causeways is of the greatest importance from the point of view of obtaining a fair price for all our produce on the right bank of the Serviar. Besides any one who has seen the distressing sight of bullocks struggling across the river with loaded carts, at Mundanthorai would be

tempted to promote the scheme on humanitarian principles alone. The construction of the causeway across the Serviar at Mundanthorai in Tinnevelly division has since been sanctioned by the Chief Conservator and the construction across the Kariar by the Conservator. The former has been completed and the latter is in progress.

103. *Inspection paths in the shola forests.*—The need for opening up the evergreen shola areas at Kannikatty and Kodamadi was recognized in 1929, when a scheme for supplying the war-devastated areas in France with cheap timber was being organized by Mr. A. W. Lushington. About 75 miles of inspection paths (45 miles in Kodamadi and 30 miles in Kannikatty), were constructed at a cost of Rs. 1,118–9–0 in order to assist in the preparation of rough stock maps of an area of about 75 square miles. As the scheme was given up, these paths were mostly abandoned with the result that many of them were obliterated either by the all-pervading reed jungle or by evergreen growth. Such of the paths as lead to the various rest-houses in these areas are being maintained, while others used frequently by elephants, provide at present the only means by which the interior of the forests can be inspected.

SECTION 4.—METHODS OF EXPLOITATION AND THEIR COSTS.

104. *Fuel and small timber.*—All fuel and small timber is extracted through the agency of contractors. The method of working and the rates vary from place to place, according to tradition, availability of labour and the demand for the produce. The following methods are in vogue :—

(*a*) On the receipt of the licence the contractor first proceeds to clear all undergrowth, and fell and coppice all tree growth except standards and reserved trees flush with the ground. This work is all done on contract by one set of axemen at a rate varying from Rs. 8 to Rs. 12 per acre according to the proximity of the coupe to village and labour, the density of the standing growth, the size of the trees and the difficulty of the terrain. Another gang of axemen converts all the fuel into billets and loads the latter into carts (where carting is possible). These are paid at the rate of 8 annas per cart-load, but this figure is increased to a maximum of 10 annas per cart-load according to the lead. All small timber is rough dressed into poles *in situ*, and loaded into carts by a third set of coolies who are paid at the rate of Rs. 1–8–0 per cart-load. Big timber, if any, is rough squared and loaded into carts at a rate of Rs. 4 per cart-load of about 20 cubic feet. In case carting is not possible the produce already felled is converted into charcoal by professional burners, who are paid at the rate of 4 annas per bag of 80–85 lbs. This system is prevalent in most of the fuel series in Kuttalam and Srivilliputtur Ranges.

(*b*) The preliminary work is the same but payment for conversion is different. In the Parivarisurian and similar poor fuel coupes of Nanguneri Range, the fuel is felled, converted and loaded into carts at a rate of Re. 1 per 100 thulams which works out at Rs. 1–9–0 per ton. Another rate paid for similar work in the better fuel series like Kalakad and Tirukurangudi, is $5\frac{1}{4}$ annas per " Thak " of about 43 stacked cubic feet ($3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet), which on the assumption that 1 ton equals 128 stacked cubic feet, amounts to about Re. 1 per ton. The rate for charcoal is 9 annas per 8 thulams which amounts to $4\frac{1}{2}$ annas per bag of 80-85 lbs.

(*c*) In Ambasamudram Range the felling, trimming of stools, billeting and stacking in heaps, are all done in one operation the rate varying from 2 annas to 3 annas per idai of $\frac{1}{8}$ ton.

105. *Method of working.*—The method of extraction in the " simple coppice " coupes is that prevalent throughout the Presidency. The annual coupe is surveyed and demarcated on the ground in accordance with the working plan map and is divided according to its size into three or more strips. On receipt of his licence, the contractor is permitted to start felling in strip I, and on completion of this strip, he is allowed to commence work on strip II provided he has paid all his dues under the terms of the contract and the Range Officer has given him a clean bill for the first strip. All removals from the coupe are covered by head-load or cart-load permits issued by the contractor or his authorized agent, and a monthly return of all permits issued is sent by the contractor to the Range Officer. In the " Coppice with standard " coupes where standards are retained at an average rate of 15-20 per acre, the marking of standards is done at the time the coupe is surveyed and the contractor is given a duplicate list of standards one copy of which he signs and returns to the District Forest Officer, in token of having taken charge of the standards, for whose safety he is responsible, until the termination of his contract.

106. *Removals of fuel by head loads.*—All brushwood and such fuel of small dimensions as would be unremunerative to cart is sold by the contractor on headload permits. The number of head load permits sold annually in the division for the triennium 1930 to 1932 is given below :—

Year.		Name of Range.				
		Srivilliputtur.	Nanguneri.	Ambasamudram.	Kuttalam.	Total.
1930	...	32,960	29,091	41,290	65,326	168,667
1931	...	31,716	26,536	33,175	69,648	161,075
1932	...	41,484	33,547	34,061	75,710	184,802

The fuel is collected thus mostly by women both for household use and for sale in neighbouring villages, and the trade forms a valuable means of supplementing agricultural income especially in the off-agricultural season. It will be observed that on an average 171,515 people visit the fuel coupes annually; it is not surprising that utilization of the produce is very complete, there being, beside thorns, little or nothing left in the coupe which would be useful for burning prior to artificial regeneration. With a view to assist regeneration operations and also to control removals from the coupes, it has been suggested that the contractor should be compelled to retain all brushwood below a minimum girth of 3 inches in the coupe, and to stack small fuel above 3 inches girth in the coupe, so that such stacks could be measured departmentally and the contractor compelled to issue only as many headload tickets as would cover the produce in his coupe. At present headload tickets are issued by the contractor as a matter of routine and there is a suspicion that removals are effected not only from the coupe but also from other parts of the forest. The remedy advanced above would improve matters and help regeneration operations, but it is open to serious objections. Firstly a large number of people who rely on this trade for their livelihood would be adversely affected and illicit removals would probably be considerably aggravated. Secondly the imposition of a girth limit on removals is bound to serve as a powerful handle in the hands of unscrupulous subordinates for petty oppression and corruption. Thirdly the compulsion on the contractor to stack his brushwood before sale would mean an increase in extraction costs which would undoubtedly affect our sale prices adversely. Fourthly the difficulty of enforcing a girth limit on removals, on an illiterate populace, should be considered. Fifthly it is the fuel below 4 inches girth which is most valuable to the palmyra sap boiling industry. Finally the ryot has learnt by long usage to go to the fuel coupes for his requirements and this is borne out by the frequently observed fact that where a fuel coupe is reasonably close to a village, illicit removals in the surrounding forest are rare. For these reasons the abovementioned restriction on such removals is not advocated.

107. *Timber.*—Evergreen shola timber is the only timber extracted in the division. Situated as the shola forests are, comparatively remote from human habitations, in localities which besides having a high rainfall and being infested with millions of leeches, are frequently malarious, it is only to be expected that exploitation is both difficult and expensive. For purposes of comparison the rates paid at Kannikatti under departmental working during 1929 to 1931, and extraction through the agency of contractors in 1932 and 1933 are set out below :—

Units.	Measurement.	Cubic contents.	Departmental rates.		Contractor's rates.			Remarks.
			Coupe I, 1929.	Coupe II, 1930.	Coupe III, 1931.	Kodamadi, 1932.	Kannikatti, 1933.	
			Cost.	Per unit.				
			RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	
1 B.G. Sleeper ..	9′ × 10″ × 5″	3·12	4 9 9	3 10 6	3 8 0	..	3 6 0	Mesua ferrea only.
2 M.G. Sleeper ..	6′ × 8″ × 4½″	1·50	2 7 0	1 13 3	1 12 0	..	1 15 0	Do.
3 Full boles	16′ × 6″ × 4″	2·66	2 6 6	2 0 6	2 0 6	1 14 0	1 10 6	
4 Three-fourths boles.	12′ × 6″ × 4″	2·00	1 13 0	1 8 3	1 8 3	1 6 6	..	
5 Half boles	8′ × 6″ × 4″	1·33	1 3 3	1 0 3	1 0 3	0 15 0	..	
6 Full kais	18′ × 5″ × 2″	1·25	1 1 0	1 0 3	1 0 6	0 15 0	0 15 6	
7 Three-fourths kais.	13½′ × 5″ × 2″	0·94	9 12 6	0 11 9	0 11 6	0 11 3	..	
8 Half kais	9′ × 5″ × 2″	0·62	0 8 6	0 8 6	0 8 0	0 7 6	..	
9 Chattam	9′ × 10″ × 2″	1·25	..	0 15 9	..	..	0 14 3	
10 Planks	8′ × 1″ × 2″	1·33	1 4 3	1 4 3	1 5 4	..	..	Artocarpus hirsuta only.
11 Do.	6′ × 1″ × 2″	1·00	1 1 0	1 1 0	1 0 0	..	..	Do.
12 Do.	12′ × 18″ × 1½″	2·25	..	..	..	1 14 0	1 14 0	Cedrela toona.
13 Vandipoles ..	....	2·22	2 0 3	..	..	..	..	Gluta travancorica only.
14 Double yerkal ..	9′ × 1″ × 4·3″	1·61	1 11 0	..	..	..	..	Mesua ferrea only.
15 Araikal	Set of 24	5·25	4 2 0	..	..	..	4 4 0	Aglaia roxbusghiana only.
16 Kattai	9′ × 5″ × 3″	0·94	..	..	..	0 12 0	..	
17 Do.	9′ × ″6 × 3″	1·12	..	..	..	1 2 0	..	
18 Scantlings	16′ × ″5 × 2″	1·11	1 1 5	..	..	..	..	
19 Do ..	12′ × 5″ × 2″	0·83	0 13 1	..	..	..	..	
20 Do. ..	8′ × 5″ × 2″	0·55	0 8 10	..	..	..	..	

N.B.—The rate for conversion of Mesua ferrea timber is 25 per cent higher as the timber is harder and badly riddled with borer holes.

108. *Method of working.*—Since there has been a widespread belief among Forest officers with local knowledge that not more than 10,000 cubic feet of shola timber can be absorbed by the local markets, extraction has been limited in the past to an area which would yield this amount of timber. The annual coupe seems to have been selected largely according to the caprice of the marking officer as a scrutiny of the 4 inches to 1-mile scale maps will show. Not more than an average of 3 trees per acre are marked as it is realized that more intensive felling is detrimental to the preservation of the essential character of this particular type of forest. Subject to this restriction trees of all exploitable species above a fixed girth limit which varies for each species and has been fixed empirically, are marked serially, with tar numbers at the base of the tree and at breast height, a marking list showing the species, girth at breast height, merchantable bole, and estimated gross volume being prepared. The trees are then put up for sale standing.

109. *System of sale.*—The first timber coupes in 1932 and 1933 were put up for sale on the system that the contractor made a lump sum bid for all the trees in the coupe. In 1933 as the bids were unsatisfactory, largely on account of the prevailing trade depression sales were by marked trees. This proved only slightly more advantageous. In the selling and buying of such forest produce it is difficult to establish a completely secure basis, owing to the large element of uncertainty as to the real value of the material put up for sale. Without some form of guarantee, purchasers are ignorant of this value, and have to rely on a marking list, which may, and frequently does, give a wrong idea of the possible outturn. The *guarantee* system of sale obviates these defects and is recommended for future adoption. Under this system, the District Forest Officer has to estimate the net outturn in cubic feet which can be obtained from a coupe, and the theory of the method of sale is that the bid is based on this estimate, which is made public to the bidders at the time of sale. The estimate is fixed on the low side to encourage the contractor to closure utilization. If the actual outturn of the coupe is less than the estimate, the contractor is refunded a proportionate amount of his bid provided that the District Officer is satisfied that the coupe has been properly worked. If the outturn is more than the estimate the contractor benefits, and the department can safeguard its interests in succeeding years as completer statistics of outturn become available. This system affects conditions of sale in two ways. The penalty for over-estimating the value of the produce sold is laid on the vendor and not on the vendee. If the latter chooses to ignore the guarantee he has only himself to blame. It also discourages gambling or at least removes all grounds of excuse for the gambler. Introducing as we are a new and yet untried system of working in our evergreen forests, it behoves us to protect the interests of intending purchasers, as it is only thus that departmental in the division during years for which reliable data is available :—

110. *Sandal.*—All sandal is now extracted under the prevailing sandalwood extraction rules and is sent after final cleaning to Tiruppattur depot, East Vellore Division, for classification and sale. The following table shows the net value of the sandal extracted in the division during years for which reliable data is available.

Year.	Cost of extraction per quarter.	Revenue realized per quarter.	Net profit per quarter.
	RS. A. P.	RS. A. P.	RS. A. P.
1923–24	1 12 5	13 1 10	11 5 5
1924–25	1 5 10	17 11 6	16 5 8
1925–26	1 8 0	....	...
1926–27	2 0 2	15 5 5	13 5 3
1927–28	1 7 10	17 1 6	15 9 8
1928–29	1 8 0	17 12 4	16 4 4
1929–30	0 15 4	16 6 3	15 6 11
1930–31	1 0 8	9 15 4	8 14 8
1931–32	1 1 4	11 0 7	9 15 3
1932–33	0 14 11	...	...

SECTION 5.—PAST AND CURRENT PRICES.

111. *Fuel coupes.*—Practically all exploitation in the division consists in selling the standing crop in the forest to contractors in public auction; departmental working of fuel coupes in the past proved much less profitable and a change in the system of working is not advocated. The prices paid by contractors for the fuel coupes have varied in the last five years from Rs. 11 per acre in the worst areas such as Ambur Felling Series, to

Rs. 70 per acre in the best, such as Kalakad Felling Series. Full details are given in Appendix IV where a tabular statement showing prices obtained for all fuel coupes from 1903 to 1932 is given. There is a marked improvement in the prices obtained for the same coupe in the second rotation in some cases, while in others there is a small decline. This cannot however be taken as an indication that the growth in the second rotation is better than in the first, as the question is complicated by supply and demand, as well as by trade conditions.

112. *Evergreen timber.*—The following statement shows the prices obtained for the various units from 1929 to 1931 during the period departmental working was undertaken :—

Name of unit.	Cubic contents.	Cost of extraction.	Retail price per unit.	Wholesale price per unit.	Net profit per cubic foot.
		RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1 B.G. Sleepers	3·12	3 8 0	...	6 0 0	0 12 9
2 M.G. Sleepers	1·50	1 12 0	...	3 0 0	0 13 4
3 Full boles	2·66	2 0 6	3 14 0	2 13 4	0 4 10
4 Three-fourths boles ...	2·00	1 8 3	2 14 6	2 2 0	0 4 10
5 Half boles	1·33	1 0 3	1 10 6	1 6 8	0 4 10
6 Full kais	1·25	1 0 6	1 10 3	1 5 3	0 3 10
7 Three-fourths	0·94	0 11 6	1 3 6	0 14 8	0 3 4
8 Half kais	0·62	0 8 0	0 12 9	0 10 7	0 4 1
9 Chattams	1·25	0 15 9	2 6 0	2 6 0	1 1 10
10 Planks	1·33	1 5 4	...	1 8 3	0 2 2
11 Do.	1·00	1 0 0	...	1 1 10	0 1 10
12 Vandipoles	2·22	2 0 3	3 9 0	2 5 8	0 3 0
13 Double yerkal	1·61	1 11 0	...	1 12 0	0 0 7
14 Arekal	5·25	4 2 0	...	5 0 0	0 2 8
15 Scantlings	1·11	1 1 5	...	1 2 10	0 1 3
16 Do.	0·83	0 13 1	...	0 14 1	0 1 2
17 Do.	0·55	0 8 10	...	0 9 4	0 0 11

The net profit per cubic foot has been calculated on wholesale prices as most of the output was sold at these rates.

The following table gives details of prices obtained for standing trees in the evergreen timber coupes sold to contractors during 1932 and 1933. For purposes of comparison the net average profit per tree under departmental working from 1929 to 1931 is also included.

Year of working.	Locality.	Number of trees.	Net revenue obtained.	Average revenue per tree.
			RS.	RS. A. P.
1929–31	Kannikatti	311	3,954	12 11 5
1932	Do.	151	800	5 4 9
	Kodamadi	159	1,300	8 2 10
	Sengalteri	100	725	7 4 0
1933	Kannikatti	138	862½	6 4 0

CHAPTER IV.—STAFF AND LABOUR SUPPLY.

SECTION 1.—STAFF.

113. *Present staff.*—The District Forest Office and Range establishments as they stand at present are shown in the following statement :—

Name of establishment.	Gazetted officers.	Rangers.	Foresters.	Forest guards.	Reserve watchers.	Clerks.	Peons.	Bungalow watchers.
District Forest Office	1	...	...	...	...	8	4	1
Srivilliputtur Range	...	1	2	10	10	1	1	...
Kuttalam Range	...	1	2	14	14	2	1	1
Kodamadi Range	...	1	2	10	9	1	1	...
Kannikatti Range	...	1	2	5	4	1	1	2
Nanguneri Range	...	1	1	11	11	1	1	1
Srivaikuntam Range	...	1	...	5	5	1	1	...
Total ...	1	6	9	55	53	15	10	5

114. *Rangers.*—In the reconnaissance report preliminary to this working plan the allocation of rangers in the division was criticized on the following grounds :—

(1) The division of the old Ambasamudram range into the present Kannikatti and Kodamadi ranges was proposed in 1921 by Mr. H. F. A. Wood as a preliminary to the intensive working of the evergreen forests in these ranges. Inspection paths, inspection sheds and coolie lines had to be built, stock maps of exploitable areas had to be prepared, and the question of establishing a sufficiency of regeneration in advance of the removal of mature timber had to be tackled. There was thus ample justification *at the time* for reducing the size of a ranger's charge, especially as our knowledge of the evergreens was extremely limited, and the silvicultural work required the personal supervision of an officer of at least the ranger's cadre. Closer investigations, however, soon proved that our evergreen forests were not the gold mines they were thought to be, and hence the original programme of work was considerably restricted, thus removing all justification for the maintenance of two ranges. Further arguments in favour of amalgamation are—

(*a*) The Kannikatti Ranger has his headquarters at Ambasamudram on the plains. As he has no subordinates on the plains, he is compelled either to send his subordinates down from the hills whenever he requires labour for works and to carry tapals, or to rely on the co-operation of the subordinates of the Kodamadi range which frequently is not forthcoming.

(*b*) The lines of separation between the two ranges as at present constituted are very artificial, portions of the Padaramalai Felling Series in Kannikatti range projecting into Kodamadi range.

(*c*) The Kannikatti ranger has at present one fuel coupe, one evergreen timber coupe (both worked by contractors), one teak plantation of about 10 acres and $10\frac{1}{2}$ miles of fair weather road to maintain annually. There is practically no protection work as the whole of the range is remote from human habitations. This hardly constitutes sufficient work for a separate ranger.

The amalgamation of the Kannikatti and Kodamadi ranges to reform the old Ambusamudram range is thus indicated. It may be necessary to give this ranger a junior as assistant in the unlikely event of our having to work the evergreen timber coupe departmentally in any year.

(2) The present Srivaikuntam range was created in 1925 with the object of accelerating the work of palmyra planting in the Kudiraimozhi Teri reserve. At present the work in the range consists of—

(*a*) The protection of the Kudiraimozhi Teri and Vallanad reserves, an aggregate area of only 16,000 acres, 11,000 acres of which consist of sand dunes sparsely afforested principally by the palmyra.

(*b*) The working of one "Simple Coppice" felling series in the Vallanad reserve, the annual coupe being about 60 acres in extent.

(*c*) The planting of some 250 acres in the Teri reserve with palmyras. This area is further proposed to be reduced to 100 acres annually for reasons detailed in paragraph 518.

The quantity of work is therefore insufficient to justify the employment of a separate ranger. It is therefore proposed to amalgamate this range with the present Nanguneri range as was formerly the case and proposals to this effect are laid down in paragraph 552, Part II.

The present headquarters of the Nanguneri ranger are at Sivanaperi; it is strongly recommended that they be shifted to Nanguneri for the following reasons :—

(*a*) Nanguneri is the headquarters of the Sub-Magistrate, Tahsildar and Sub-Treasury Officer with all of whom it is desirable that the Range Officer should be in close touch.

(*b*) Nanguneri is more centrally situated than Sivanaperi for the new combined range which will include the present Srivaikuntam range, as it is 8 miles nearer to Nazareth in the Kudiraimozhi Teri reserve, and what is more important is connected with Nazareth by regular combined bus and train services.

(*c*) Nanguneri unlike Sivanaperi has a Government hospital with a Civil Surgeon in charge.

(*d*) Nanguneri unlike Sivanaperi is situated on the main Travancore-Palamcottah trunk road and the postal service is accordingly much quicker.

(*e*) Nanguneri unlike Sivanaperi has a telegraph office.

115. *Foresters.*—The sanctioned strength of foresters for all the ranges as they stand at present is adequate. With the abolition of the Srivaikuntam range however an additional Senior Forester will be necessary in the new Nanguneri range to supervise the work in, and for the protection of, the Kudiraimozhi Teri and Vallanad reserves.

116. *Forest guards.*—The existing distribution of beats in each range is as follows :—

Srivilliputtur Range.

Name of beat.	Headquarters.
1 Khansahibpuram	Khansahibpuram.
2 Pudupatti	Pudupatti.
3 Rengarkoil North	Srivilliputtur.
4 Rengarkoil South	Do.
5 Athithondu North	Mudaliaruthu.
6 Athithondu South	Athithondu.
7 Valaikulam	Do.
8 Ayyanarkoil North	Mudangiar.
9 Ayyanarkoil South	Do.
10 Kunnur	Kunnur.

Kuttalam Range.

11 Vasudevanallur North	Narayanapuram.
12 Vasudevanallur South	Do.
13 Karuppasamikoil	Chellapuli.
14 Puliangudi	Melapuliangudi.
15 Krishnapuram North	Chokkampatti.
16 Krishnapuram South	Kongankulam.
17 Kadayanallur	Kadayanallur.
18 Vadagarai Kilpidagai	Vadagarai Kilpidagai
19 Chinnakadu	Kasidarmam.
20 Panpuli	Panpuli.
21 Vallam	Vallam.
22 Kuttalam West	Kuttalam.
23 Kuttalam East	Kudiyiruppu.
24 Madalamparai	Madalamparai.

Ambasamudram (Kannikatti and Kodamadi) Range.

25 Kadayam North	Mettur.
26 Kadayam South	Govindaperi.
27 Sivasalem	Sivasalem.
28 Ambur	Do.
29 Koraiyar	Papanasam.
30 Aladiyur	Do.
31 Koilteri	Pechiammiankoil.
32 Kuduvarai	Kodamadi.
33 Kodamadi	Do.
34 Padaramalai	Mundanthorai.
35 Kariar	Do.
36 Ullar	Kannikatti.
37 Kannikatti	Do.

Nanguneri (Nanguneri and Srivaikuntam) Range.

38 Kolundamamalai	Sermadevi.
39 Terkuviravanallur	Pudukudi.
40 Vadagarai East	Padmaneri.
41 Vadagarai South	Sivanaperi.
42 Kalakad	Do.
43 Malayadipudur North	Do.
44 Malayadipudur South	Nambikoil.
45 Sengalteri	Kuvapatti.
46 Parivirisuriyan North	Tirukurangudi.
47 Parivirisuriyan South	Do.
48 Tirukurangudi	Nambikoil.
49 Teri North	Nazareth.
50 Teri South	Neivalai.
51 Kanam	Kanam.
52 Vallanad	Vallanad.
53 Manakarai	Alvarkulam.

The above distribution has been examined with a view to discovering whether each beat guard is adequately employed throughout the year. As a result of this examination it was found necessary to reduce the size of beats which were found to be too large and increase the size of beats wherever the work was found to be inadequate. The division has accordingly been divided into 51 beats the limits of each beat being marked on the working plan maps. The proposed list of beats is given in paragraph 551, Part II. In addition the two forest guards now employed on special duty in connexion with evergreen timber extraction and regeneration, and teak plantation work in the Ambasamudram range will continue to be required.

117. *Office establishments.*—The state of the District Forest Office of recent years has been a cause of complaint to most incoming District Forest Officers. An examination of the distribution of work has shown that the office is understaffed. With a view to a more equitable distribution of work and in order to cope with the increased work involved in the maintenance of control records prescribed under this working plan, an extra clerk is an urgent necessity.

The work in Kuttalam range does not justify the retention of two range clerks. One of them can, therefore, be transferred to the District Forest Office. With the amalgamation of the present Kannikatti and Kodamadi ranges, the existing two range clerks will be required for the new Ambasamudram range as there will be ample employment for both.

The amalgamation of the present Nanguneri and Srivaikuntam ranges will probably also result in an increase of office work which may necessitate the employment of both the present clerks. Provision will accordingly be made, but both clerks will not be employed unless it is found by experience that one is insufficient. Changes in the office establishment will be prescribed on the above lines.

118. *Permit-issuing officers.*—It has been customary in the past to employ permit-issuing officers for the collection of grazing and manure leaf revenue, these officers being paid a commission of 6¼ per cent on the revenue collected. In 1931–32, it was ordered as a measure of retrenchment that this revenue be collected by the range officers themselves, selected foresters being also especially empowered to do so. The system of departmental collection of revenue while undoubtedly saving the commission to permit-issuing officers, is open to serious objections. Firstly to have the same machinery both for issuing the permits and for checking them is objectionable as it gives ideal opportunities for illicit gain, and check is bound to be perfunctory, it being to the interest of the checking officer, usually a beat guard, to be lax in his work in order to cover up any deficiencies in the issue of permits by the issuing officer, who is usually his superior. Secondly, for the purpose of collecting the full revenue the forester or range officer is compelled to visit the ryot in his village at a time when the latter has money and persuade him to take out permits. This frequently exposes this class of officer to ridicule and sometimes to open abuse. It is not consistent with the dignity of his office, that he should be open to such treatment. Again, the purchase of grazing permits from permit-issuing officers was largely effected by the ryot on the credit system. The forest officer is forbidden to allow credit officially. Finally a great deal of the time of the subordinate staff, which could be more usefully employed in regeneration and other work in the forest, tends to be wasted in ineffectual wanderings from village to village in search of likely purchasers of grazing permits. The old permit-issuing officer was usually a man with local influence and was personally interested in the collection of the grazing revenue. He not only knew all the cattle owners intimately enough to trade with them on a credit basis, but also ensured in his own interests that all cattle going to the reserves were covered by permits. He also served as a valuable check on the subordinate staff, by bringing to the notice of higher authorities any connivance on the part of subordinates with local graziers. It seems desirable, therefore, to return to the old system of permit-issuing officers, as far as the collection of grazing revenue is concerned. Their commission will be reduced from 6¼ per cent to 5 per cent.

119. *Manure leaf revenue.*—The demand for manure leaf is largely seasonal; large quantities are wanted for wet lands just before the north-east monsoon with the result that the demand is restricted to the months of September–October. This is the period when regeneration work, rab-sowings, have to be done, and neither the range officer nor his foresters can spare the time necessary for the issue of manure leaf tickets. The right to sell manure leaf tickets was put up to auction in 1922–23 in Srivilliputtur range, and fetched a handsome sum of Rs. 3,345. Why the system was abandoned is not apparent. If the removal of this produce from the forest is to be permitted at all, there is no reason why a reversion to this method of sale should not be effected. The advantages are undeniable. The contractor would be interested in obtaining the maximum revenue, and

hence would serve as a check on the work of the subordinate staff. A lot of office work in the way of preparing permit returns, etc., would be saved. The system will, therefore, be prescribed.

SECTION 2.—LABOUR.

120. *General.*—No difficulty is usually experienced in obtaining unskilled labour for departmental works such as, regeneration, fire line and coupe line clearing and road repairs. The demand for agricultural labour being seasonal unskilled labour is apt to be scarce at harvest or sowing time. The number of festivals celebrated annually by the ryots of the division, however, preclude the detention of labourers for any length of time away from their homes and is accordingly a source of annoyance to employers of labour.

121. *Hill tribes.*—The only inhabitants of the ghats are the Kanis and the Palayars. The Palayars are a malodorous and unsightly race, with short bodies, square faces, thick lips and unkempt hair. Men and women wear a small cloth or palm leaf sheath about their thighs; they scarcely even bathe and when they do, it is only (as they explain) to keep themselves cool and not clean. Their language is a corrupt form of Tamil. They live in groups of one or two families in the *pudais* or caves in the ghat forests, occasionally rigging up rough shelters of reed and leaves for comfort in the dry weather. Most of them collect minor forest produce, such as roots, honey and wax, cardamoms and dammar for the renters under the Forest department, and receive grain in payment which they cook and eat at once, with great avidity and improvidence. Otherwise their foods are generally taken raw. All told they number about 40 persons in Srivilliputtur range and about 20 individuals in the hills overlooking the Sankaranayinarkoyil taluk in Kuttalan range. A few are being utilized at present very successfully by the Srivilliputtur ranger in sandalwood extraction work, mainly in the transport of sandalwood trees to the forest depot and in guarding the latter. They are not by nature hunters of game and are useless as trackers. They do not keep cattle or cultivate. Having exhausted the resources of a particular locality they move on to another *pudai.* Marriage ties are of the flimsiest character and promiscuous relationships common. Child birth is a simple matter and is considered not to require more than two days holiday. Old and useless people are neglected and left to die. They have no headman and every one settles his own quarrels.

122. *The Kanis.*—The Kanis are to be found in the neighbourhood of Kannikatty and in the Singampatti zamin. They are also called *malai arasans* and are supposed to be the oldest race in the division having been driven into the hills by the first invaders of the plains. They are much more civilized than the Palayars. Their settlements, called *vadis* consist of huts, made of reed, grass and small timber, and are situated strategically away from the haunts of men or animals. Surrounding these dwellings are the patches of land they cultivate. The ground is first cleared of tree growth and the felled matter well burnt. After the first shower of rain it is roughly chopped up with a bill-hook, and is ready without further tillage to be sown. Cholam, tapioca, sweet pottatoes, plantain and chillies are the usual crops and form their staple food. In addition each *vadi* is permitted by the Abkari authorities to grow five ganja plants (*Cannabis sativa*) per head. This narcotic is smoked by men, women and children, and is largely to blame for the marked deterioration of the physique of the race. When their land shows signs of exhaustion, that is, after a couple of years, they move on, if permitted, to another spot and repeat the process of clearing, burning and planting. This habit of shifting cultivation has been responsible for the destruction of the fine shola forest which at one time undoubtedly clothed the Ullar, Peyar, Upper Kariar and Serviar valleys. In the early part of the century, the Forest department decided to control their ravages by allotting them sites on the right bank of the Peyar. Most of them moved across the Tambraparni to the Singampatti zamin or over the frontier into Travancore, where they are not subject to such severe restraints. There is at present a small settlement of eight male members on the right bank of the Peyar. These men find intermittent occupation in the Kannikatty forests, in the regeneration of gaps in the evergreen timber coupes, and in the clearing of the common boundary line between Kattalaimalai estate and the Government forests. They were of great use to the working plans party, their expert identification of the commoner evergreen species, as well as their unrivalled knowledge of the forest being invaluable. Although of poor physique they make excellent forest guides and show remarkable powers of endurance. Each settlement has its hereditary headman who exacts implicit obedience and is much feared. The marriage tie is respected but divorce is permitted by mutual consent. Their language is a mixture of Tamil and Malayalam.

123. *Ponam plantations.*—Attempts have been made from time to time to divert their energy in the matter of shifting cultivation into useful channels, by giving them areas to plant up with teak in conjunction with fieldcrops. The *ponam* teak plantation of 1912 raised thus, in the Kariar valley is a fine example of what they can do under proper

control. The average costs of departmental teak plantations in this division in the past has been Rs. 40 per acre. With a view to reducing this cost considerably it seems desirable to permit the Kanis to practice *ponam* cultivation in the Clear Felling Working Circle, especially as they have recently professed a great desire to do so. They will have to be carefully watched, however, as Mr. P. M. Lushington, who had intimate dealings with them in the past, held the opinion that they were the laziest, most unreliable and mischievous of the jungle tribes he had come across. His condemnation of the tribe in an inspection note of 1915 is worth quoting, "That the Kani has been a regular curse to the district there is not a shadow of doubt. He is the one hillman who is still allowed to practice shifting cultivation. In days gone by he has ruined by this system much of the fine shola round Kannikatty. He has taken a large slice comparatively recently out of the Peyar valley and left it a waste. He has ruined the Ullar valley which is now recovering from his depredations, and he has denuded the Kariar valley which has, however, nearly rehabilitated itself. He is now actively engaged in destroying the fine shola forest of Singampatti zamin and Kattalaimalai estate. The effect of his destruction on the flow of water in the Tambaraparni must be immense. Wherevr he has gone he has spread lantana which has been a further source of annoyance. He is a shiftless creature, who does not like to do any work. He will not uproot lantana because the grass cuts him, cannot attend the Survey party in Travancore because of leeches, and always has an excuse against doing anything at all except destroying a further area of forest. We have got rid of him from the Government forest with the exception of ten families located in Kariar and I trust that we shall get rid of him permanently."

The present day Kanis, however, have been apparently chastened by adversity, as they have been found to be willing though somewhat erratic workers. With the exercise of tact and kind but firm treatment, there is little doubt that they will in time form a valuable contribution to the labour supply in the interior ghat forests. The Hukdar of Kattalaimalai estate has converted some of them to Christianity, and although they remain indifferent Christians, he has found them good labourers. Labour from the plains is less able to bear the feverishness, inclemency of the weather and the loneliness prevalent in the ghat forests, and hence cannot be retained for more than a week at a stretch. Besides, it has to be paid at higher rates than Kani labour, and is much less efficient in planting operations and work which involves the use of a bill-hook. The total ignorance of most of our evergreen species exhibited by the average plainsman is also a serious objection against his employment in regeneration and tending operations in our evergreen forests. For these reasons, it would be advantageous to encourage the Kani, by giving him all reasonable concessions, to settle in our forests.

124. *Unskilled labour.*—The rates paid in the recent past for unskilled labour, employed in the various ranges of the division are given in the tabular statement below :—

	Man.	Woman.	Boy.	Reserve watchers per mensem.	Fire patrol per mensem.
Srivilliputtur Range.					
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1 Outer slopes	0 6 0	0 4 0	0 5 0	10 0 0	10 0 0
2 Interior ghats	0 10 0	0 7 0	0 7 0	12 0 0	...
Kuttalam Range.					
Kuttalam Range	0 6 0	0 4 0	0 5 0	10 0 0	8 0 0
Ambasamudram Range.					
1 Outer slopes	0 8 0	0 5 0	0 4 0	10 0 0	10 0 0
2 Mundanthorai plateau	0 9 0	0 6 0	0 5 0	...	...
3 Minor ghats	0 12 0	0 7 6	0 8 0	12 0 0	...
4 Kanis	0 8 0	...	0 6 0	10 0 0	...
Nanguneri Range.					
1 Outer slopes	0 8 0	0 5 0	0 5 0	10 0 0	10 0 0
2 Interior ghats	0 10 0	0 8 0	0 8 0	...	10 0 0
3 Plain forests	0 8 0	0 5 0	0 4 0	...	10 0 0

These rates, though lower than what was paid two years ago, are no doubt, now capable of further reduction. The term "outer slopes" denotes any locality on the hills from which the labourer can return to his village after the day's work.

The term "interior ghats" denotes places which are a full day's march from the villages on the plains and where labour has to camp with provisions, that is areas above the 2,000 feet contour. The Mundanthorai plateau includes Mundanthorai, Kariar, Kodamadi and their immediate surroundings.

The comparatively high rate for daily labour in Ambasamudram range is due to the keen demand for labour at the cotton mills at Papanasam. Labour is scarce in the Nanguneri taluk which is sparsely populated; hence comparatively high rates have to be paid.

125. *Skilled labour.*—Labour for building and carpentry and masonry works is paid on the following scales :—

	Mason first class.	Mason second class.	Carpenter first class.	Carpenter second class.	Sawyer.
Srivilliputtur Range.					
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
1 Outer slopes	1 0 0	0 12 0	1 0 0	0 12 0	1 0 0
2 Interior ghats	1 8 0	...	1 8 0	1 4 0	1 8 0
Kuttalam Range.					
	1 0 0	0 12 0	1 0 0	0 12 0	1 0 0
Ambasamudram Range.					
1 Outer slopes	1 0 0	0 12 0	1 0 0	0 12 0	1 0 0
2 Mundanthorai plateau	1 4 0	1 0 0	1 4 0	1 0 0	1 4 0
3 Interior ghats	1 8 0	1 4 0	1 8 0	1 4 0	1 4 0
Nanguneri Range.					
1 Outer slopes	1 0 0	0 12 0	1 0 0	0 12 0	1 2 0
2 Interior ghats	1 4 0	1 0 0	1 4 0	1 0 0	1 6 0
3 Plain forests	1 0 0	0 12 0	1 0 0	0 12 0	1 0 0

It is to our advantage to engage skilled labour wherever possible on piece-work terms and not on daily labour. This is especially the case with felling and conversion in timber coupes, where payment on outturn represents the only way to overcome the difficulty of supervision. Sawyers for work in the evergreen timber coupes are not available locally except at prohibitive rates. They have, therefore, to be imported either from Travancore and Cochin or from Rajapalayam in Ramnad district. The west coast men are more acclimatised to work in evergreen forests, and are also finer workmen than the Rajapalayam sawyers, although the skill of the latter is not to be disparaged.

126. *Labour in fuel coupes.*—Exploitation of fuel coupes by contractors is carried out invariably on a piece-work basis referred to in paragraph 104 above. The coppicing of the tree stumps is beyond criticism, the Rajas, a Hindu caste, of Srivilliputtur range particularly excelling in this work. An agent or two is usually employed by the contractor for supervising the work in the coupe, and these men probably from long experience are expert judges of the outturn of a coupe. They are paid a monthly wage varying from Rs. 15 to Rs. 30 a month. Labour is recruited for work in the coupes by the agents, and the local fuel coupe contractor who advances large sums to *Kanganies* or recruiters of labour, practically controls the labour supply. The large amount of advances outstanding annually, acts as a powerful factor in compelling the previous year's fuel coupe contractor to take the current year's coupe, frequently at a sacrifice, in order that he may be in a position to recover the previous year's outstandings. His enemies are well aware of this, with the result that coupe prices at the public auction frequently reach uneconomic heights. Though at first sight this may appear to be highly satisfactory, it is not really to the advantage of the department, as it is not to our interest to ruin any contractor who has done good work for us in the past. Therefore when there is reason to believe that such a state of affairs exists it may be advisable to depart from the usual procedure and call for sealed tenders for a particular coupe instead of putting it up to public auction.

CHAPTER V.—PAST SYSTEM OF MANAGEMENT.

SECTION 1.—GENERAL HISTORY OF THE FOREST.

(*a*) *Early history.*

127. *The Indian dynasties.*—The dawn of history found the Pandyas in possession of the greater part of the division. Native tradition as well as ancient writings and inscriptions represent the founders of the Pandyan dynasty to be three brothers, Pandyan, Cholan and Cheran, of the now extinct village of Korkai, at the mouth of the Tambraparni. Pandyan according to tradition ruled over the present Madura, Ramnad and Tinnevelly districts. Of the antiquity of the Pandyan Kingdom there is ample evidence. Megasthenes who about 302 B.C. was sent as an ambassador by Seleucos Nicator, one of the successors of Alexander the Great, to the court of Chandra Gupta, King of Pataliputra, near Patna, speaks of a country called " Pandia " named after the daughter of the " Indian Hercules " Krishna. That the Pandias occupied a high political and social position may be inferred from the fact that the Roman Emperor Augustus sent an embassy to them. The Pandyan dynasty remained, as the rulers of the division or intimately associated with its history right up to the middle of the sixteenth century A.D. when it was replaced by the Nayakkan dynasty (1559–1736). The Nayakkan rule came to an abrupt termination with the Muhammadan invasion of 1736 under Chanda Sahib.

128. *The British conquest.*—The next period in the history of the division saw a struggle between the French and the British for the mastery of the Presidency. This struggle after many viscissitudes ended in victory to the latter, who in 1781, obtained from the Nawab of the Carnatic, the management and control of the revenues of all the Carnatic provinces including Tinnevelly and Ramnad on the condition that the Nawab was allowed a sixth of the revenue for his personal use. In 1790, a Board of assigned Revenues was created to administer the revenues and Mr. Benjamin Torin was appointed the first Collector of Tinnevelly. A decade of acute anxiety caused by a succession of Poligar (local chieftain) rebellions followed. Military reports of the suppression of these rebellions are replete with descriptions of the extent to which the dense jungle surrounding the forts of the Poligar Chieftains at Vasudevanallur, Sivagiri and other places in the plain country hampered military operations. The tracts in question are now quite bare of forest growth. On the 31st of July 1801, an agreement was effected with the Nawab of the Carnatic by which the exclusive administration of the Civil and Military Governments of all the territories and dependencies of the Carnatic was handed over to the East India Company in perpetuity. Mr. Lushington the first Collector of the district under the new Sovereign power, reported shortly after that the province of Tinnevelly had been brought " without the smallest disturbance under the company's authority."

It does not appear from the available information on the subject, that any steps were taken by the Indian Rulers to conserve the forest resources of the division. Cultivation was restricted to the rich river valleys, the intervening land being covered with jungle, which was infested by robber gangs who made travelling without a strong escort a risky adventure to be undertaken only under the direct necessity. The only attempt at conservation which deserves mention is the " tree-tax." Palmyras and some 38 kinds of trees, including teak, rosewood, mango, jack, *Bassia latifolia*, tamarind, soap nut, and marking nut trees enjoyed the dignity of taxation from very early times, the revenue from the palmyra tax being over a lakh of rupees and that from other trees being about Rs. 27,000 at the beginning of the Company's rule. The Government reserved the full right to the timber of these trees, only the usufruct of the tree being utilizable by the pattadar.

(b) *The British occupation* (1801–54).

129. *Early period.*—For years after the assumption of the district by the British the forests attracted but little attention from the Government; undoubtedly there was too much of it, and the conversion of a large part of it into cultivable land was most desirable. It appears that from the earliest times, ryots were permitted to fell and remove without permission or payment, wood for agricultural implements only, and fuel not exceeding a head-load at a time, for domestic consumption. Timber when felled was subject to a tax which in the absence of all supervision was easily evaded. The right to collect minor forest produce and to fell trees other than " valuable " ones for small timber for house building and for fuel was farmed out under the comprehensive term " hill rents " and formed a regular though insignificant item of the land revenue. In the periodical leases however no definition of what constituted a " valuable " tree was attempted, with the result that the renters under Government not only habitually felled valuable trees, but even claimed the sole prescriptive right to do so. This state of affairs was suppressed in 1842 when Sir H. Montgomery, the Collector, notified a list of ' valuable ' trees and prohibited their removal except on the receipt of permission from the Tahsildars and on payment of their value at fixed rates. In the interests of ameliorating the condition of the hill tribes who, it was considered, were being oppressed by the lessees, the ' hill rents ' were discontinued from 1854 under the orders of Government, at the same time the renter's privileges of felling other than ' valuable ' trees for fuel and general domestic purposes was extended to all classes of the population. This general licence, in the absence of adequate supervision soon resulted in the rapid destruction of the plain forests and the more accessible ghat forests on the outer slopes, so that the need for conservation and for a special conservancy staff soon began to be felt.

(c) *The Jungle Conservancy Period* (1854–66).

130. *Beginnings of conservancy.*—With a view to prevent the unrestricted felling of wood and the consequent destruction of jungles, to conserve the more valuable trees from the danger of extinction, and also to bring uniformity in the treatment of forest produce throughout every district in the Presidency, the Board of Revenue issued in 1860, circular No. 5497, which consisted of a simple set of rules called the Jungle Conservancy Rules. The subject-matter of the rules may be summarized as follows :—

(*a*) No timber tree, exceeding 3 feet in circumference at 2 feet from ground level nor any ' reserved ' tree in any jungle owned by Government was to be felled except with the permission of the Public Officers deputed for the purpose, and in such localities and on such conditions as they determined.

(*b*) Villagers could cut fuel for domestic purposes but not *for sale* in low jungle and brushwood without taxation.

(*c*) Charcoal burners could fell only in such places as were assigned to them by competent authority, and were prohibited from felling 'reserved trees.' A seigniorage of 1 anna per basket of one piled *para* was to be charged.

(*d*) Bonafide ryots were permitted to fell such wood (required for the erection of their own houses), as did not come under clause (*a*), provided that at least 29 standards per acre were retained on the area exploited for the purpose. No reason for the magic number 29 was advanced, nor were the girth measurements or species of the standards specified.

(*e*) Wood required for agricultural implements, as well as bamboos for bona fide domestic purposes, were permitted to be removed without payment.

(*f*) No fruit tree or sapling of timber species could be felled or injured.

(*g*) The trees 'reserved' for the value of their wood were—

1. Ebony.
2. Satinwood.
3. Teak.
4. Rosewood.
5. Palmyra.
6. Jack.
7. *Artocarpus hirsuta.*
8. *Terminalia belerica.*
9. *Terminalia paniculata.*
10. *Acacia arabica.*
11. *Albizzia lebbek.*
12. *Acacia catechu.*
13. *Hardwickia binata.*

(*h*) Trees reserved for the value of their products were—

1. *Anona squamosa.*
2. *Psidium guava.*
3. *Sapindus emarginatus.*
4. *Bassia latifolia.*
5. *Anacardium occidentale.*
6. *Acacia concinna.*
7. *Tamarindus indicus.*
8. *Calophyllum inophyllum.*
9. *Strychnos potatorum.*
10. *Mallotus philippinensis.*

(*i*) On fuel and bamboos cut *for sale*, a seigniorage of 5 annas per cart-load, 1 anna per bullock-load, and 3 pies per headload was to be levied.

(*j*) On timber cut *for sale* a seigniorage of Re. 1 per cart-load was to be paid. A *licence* and a *voucher* covered all removals from the forest.

(*k*) The collection of the revenue was to be undertaken by the village headman who was to be paid a commission amounting to 20 per cent of the revenue collected. Any misappropriation on his part was made punishable under Regulation IX of 1822.

(*l*) Cases of evasion of payment of the fees or unauthorized cutting of wood were made punishable according to the Penal Code under Fraud and Trespass.

131. *The Jungle Conservancy Fund.*—The revenue collected from these sources was allotted to the Jungle Conservancy Fund, and was to be expended in the raising of new plantations and the improvement of existing ones. The plantations were to be formed close to villages for the convenience and comfort of village communities and to guard against an eventual scarcity of wood. The Collector was given the liberty of administering the fund, subject to the submission of an annual report to the Board of Revenue in a specified form, showing the progress made and the amount collected and expended. Such were the humble beginnings of forest conservancy in the division.

132. *Defects of the system.*—The task of collecting the revenue and supervising removals soon provide too much for village establishments and a special conservancy establishment consisting of a supervisor and two peons was appointed for each taluk. The so-called '*licence and voucher*' system served at best only as a slight check on the extensive denudation of the tree growth which was taking place on the plains. Only the reserved trees were conserved, i.e., about a score of species out of the hundred or more which occurred in the forests. Many of the latter were capable of yielding fine timber, but being unreserved, even immature saplings must have been felled and

removed, as in addition to the jungle wood licences, every ryot was allowed to cut his requirements annually without payment or restriction. The effort to form village plantations was a total failure partly from insufficiency of funds and lack of knowledge of planting methods, but chiefly from the apathy and the utter indifference of the people themselves, their short sightedness in not appreciating the advantage of an undertaking, which did not appear to them to give an immediate or individual return, being commented upon by almost every Collector of the district. Again relying for its success as the system did on the village headman, who was in receipt of an outrageous commission on the revenue collected, it is not surprising that it proved wholly ineffectual to arrest the denudation of the ghats.

133. *Plantations.*—Another denuding agency deserves comment here. Between 1795 and 1800, nutmegs, cloves and species of all kinds were imported from the Moluccas by the Company's Commercial Resident and introduced on the slopes of the hills in the neighbourhood of Kuttalam, the peculiar climate of which was thought to lend itself admirably to the cultivation of such exotics. The gardens bore fruit in 1813 and samples of the nutmegs, cloves, cinnamon and coffee were sent to Madras for the European market. The produce was so unfavourably reported upon by the English merchants, that the gardens were all sold to the public at a loss, the spice gardens alone being retained as being of 'experimental' value. The expenditure on these gardens invariably exceeded the receipts. In 1843, the Collector Mr. E. B. Thomas with unusual horticultural zeal, set to, to prune, manure, and thoroughly overhaul the gardens with the result that they almost paid for themselves for a few years. He also introduced mangosteens, a little tea, and some cocoa trees. He made up some of the cocoa and gave it to some of his friends at Palamcottah, where as he somewhat cryptically reported "it was drunk without observation." In 1853 all the gardens (with the exception of the one over Panpuli which was handed over to Travancore) were sold for Rs. 9,841 thus saving the Government an expenditure of Rs. 3,000 a year on their maintenance. The experiment however encouraged native enterprise, with the result that large blocks of shola forest on the Kuttalam hills such as Terkumalai estate, were assigned by Government for coffee planting. These attempts proved equally unremunerative with the result that many of them were subsequently absorbed in the reserved forest. The estates mentioned below survive to this day. They still yield a little inferior coffee, nutmegs, cloves and a few mangosteens. Plantain cultivation is being attempted in Vasudeva Estate in Kuttalam but wild boar and elephant consume or destroy a lot of the produce. Some estates are mainly worked for charcoal, for example, Kuliratte and Hope Estates, and some for timber as is Terkumalai Estate. This naturally increases the chances of illicit removals from the adjacent Government forests and frequent inspections are necessary to ensure that no Government produce is removed along with the Estate produce.

Name of estate.	Extent in acres.
1. Udetam	11·23
2. Unjalkatti	9·00
3. Ramakkalteri	60·56
4. Terkumalai and Parathesipudai	615·91
5. Kuliratti	27·20
6. Spice garden	6·73
Total ...	730·63

134. *Coffee plantations.*—At about the same time a number of small coffee estates were being laid out in the Nanguneri hills the earliest clearing the Mahendragiri estate (now reserved forest) having been made in about 1840. The competition of Travancore coffee, leaf disease and the unsuitability of the locality for coffee, combined to ruin the enterprise. At the time of the forest settlement in 1902, the Nanguneri hills contained 27, such estates, some of which had been definitely abandoned while others had a name but no local habitation. At present there are only two small estates in the hands of the Nanguneri Mutt near Netterikkal. In one of them, the little Mampudai Estate, a few acres have been laid out with tea, which has not taken kindly to the locality. These attempts at coffee planting in the hills were responsible for the destruction of a considerable area of shola forest. The danger thus involved to the conservation of water and irrigation dependant on mountain streams was forcibly urged in 1865 by Mr. Mac Gregor, then Sub-Collector of Shermadevi, and it was owing largely to his efforts that a block of 500 acres in the Kannikatty evergreens escaped narrowly from the demand of a European coffee prospector.

(*d*) *Transition Period* (1865–82).

135. *Forest reservation.*—Meanwhile the subject of forest conservation had been taken up seriously by Government, and Captain Beddome was sent to the district in 1864 to advise the Collector generally on forest matters and to constitute the jurisdictions of the newly created 'Special Department' in charge of the forests of the division. Various parts of the ghats, amounting in all to about half the forest area of the division, were claimed as private property by no less than ten zamindars. The Kalakkad forests were claimed by the Tirukurangudi Mutt and though Government overruled these pretences the mutt carried the case to the High Court. The final decision in favour of Government was made only in 1909.

The whole of the ghat forests in Nanguneri Range, and such of the Papanasam forests as were not claimed by zamindars were brought under the Conservancy Rules alluded to above, and were placed in charge of a duffadar and three peons under the direct supervision of the Sub-Collector of Sermadevi. North of Kuttalam, the Vasudevanallur and Watrap Forests over which no private rights were asserted, were placed under an Overseer of the newly formed 'Special Department.'

136. *Defects of the system.*—The new arrangement soon proved unsatisfactory; the revenue officers had no time for forest work, and the Overseer, whose charge included the Madura Forests as well, found it too big for adequate supervision. Mr. Puckle, the Collector, declared that the only remedy was to hand over the complete charge of the ghat forests to the 'Special Department' and this was done in 1866, Captain Fullerton being appointed the first District Forest Officer of the combined Tinnevelly and Madura Forests.

137. *Collector Puckle.*—Mr. Puckle deserves a paragraph for himself. His zeal for conservancy outran even that of the Forest Officers of the period. His statement of the situation in 1866 deserves to be quoted *in extenso*. He said "The prosperity of the river irrigated section of Tinnevelly extending through five taluks is dependant on a continuous flow of water in the rivers that rise in the western ghats. This continuous flow has notably decreased of recent years, and the decrease commenced with the destruction of much of the forest that formerly clothed the ghats and protected the head waters of the streams; the rich sholas in the ravines down which the streams descend, attracted coffee planters, who destroyed the magnificient timber and thus let in the wind which has extended the mischief done by the axe. Thousands of trees lie prostrate and the coffee gardens are mostly wind blown and useless. Where the ground was once continuously moist, it is now parched and dry and the course of numerous little rivulets that once fed the larger streams are now rocky nullahs devoid of water. The mischief is done so far, and cannot now be repaired, but what we can do is, to conserve the remaining forest most carefully, with a view to increase the number of perennial streams. The people themselves are unanimous in their desire for conservancy as even at the foot of the hills they now begin to suffer, and lower down the streams there is always an outcry for water." Mr. Puckle accordingly prescribed the issue of licences to cut timber; he forbade cultivation (except coffee), and charcoal burning in the forests, and restricted grazing and the cutting of fuel by the ryots to certain limits defined separately for each village. In this respect he did not initiate a new policy as his predecessors Messrs. Bird Eden, Montgomery and Thomas had since 1837 prohibited dry cultivation on the slopes of the hills "as it tended to the clearing of forests which rendered to the mountains bare of trees and thereby prevented the clouds from descending on the hills during the monsoon thus resulting in scarcity of rain." While however his predecessors hoped to increase the rainfall by promoting conservancy, Mr. Puckle was guided in his action by more correct views regarding the effect of forests on surface drainage. Captain Beddome felt that these prohibitions endangered forest revenue and advocated a system of regulated fellings. Mr. Puckle, on the grounds that the irrigation of the district would be seriously jeopardized if Captain Boddome was allowed to have his way, appealed to Government, who warmly supported him. In 1869 Captain Beddome revisited the division and reported that the best efforts of every one concerned had failed to secure anything that could properly be called conservation.

138. *Private forests.*—The problem of the private forests in the division still remained unsolved. The claim most antagonistic to the new reservation policy of Government was that of the Singampatti Zamindar. The Singampatti forests commanded the upper reaches of the Tambraparni and the sources of a number of the affluents of this important river. There were several alternatives; to take the forests on lease; to resort to litigation; to acquire the property under the Land Acquisition Act; or to override what was considered the doubtful claims of the zamindar by assuming the property. As a result of litigation in the High Court, the zamindar was successful in establishing all his

claims, and this decision was ultimately confirmed by the Privy Council. In spite of the best efforts of Government therefore this valuable catchment area was lost to the department.

A large area of some 8,000 acres of shola forest has been leased out by the zamindar during the last decade to the Bombay-Burma Trading Corporation for conversion into tea estates. The District Irrigation Committee has protested strongly against this alienation, on the ground of the possibly deleterious effects the destruction of shola forest in the catchment area of the Tambraparni, may have on the regular flow of water in this river. Fortunately owing probably to the depressed state of the tea industry, only a small portion of this area has been felled and the damage done to the catchment area is not yet apparent.

The claims of the other zamindars, Chokkampatti, Sivagiri, Vairavankulam and Tirumalainaicken Pudukkudi, were considered of less importance from the point of view of irrigation and hence no attempts were made either to contest or to secure control over them. The existence of these zamindaris to the present day, sandwiched as they are between tracts of Government forests, forms a great obstacle to the practical management of the forests of the division. Owing to the laxity of supervision prevalent in zamin forests, fires are of common occurrence and are a menace to the adjacent Government forests, necessitating the annual maintenance of expensive fire lines along the common boundaries. This, combined with overgrazing, has resulted in such a deterioration of many of the more accessible zamin forests, that the state of the adjoining Government forests forms an object lesson, even to the uninitiated eye, on the benefits of forest conservancy.

139. *The Kattalaimalai Estate.*—In the Papanasam reserve a private forest of some 4,000 acres called Kattalaimalai Estate was claimed by the Chokkampatti Zamindar. Situated as it was in the catchment area of the Tambraparni and one of its principal affluents, the Kariar, various expedients were tried to secure it, until in 1876 the project was finally abandoned. An opportunity for acquiring it by purchase in 1893 was lost, the property going to the Roman Catholic Mission in a court auction for Rs. 17,000, a trifling sum considering the importance of acquisition. It contains at present about 330 acres of coffee estates, 125 acres of which are in bearing, an extensive fruit garden (limes, oranges and coconuts) which is leased out annually for Rs. 3,000 and has an income of about Rs. 1,500 per annum from the sale of fuel on cart-load permits.

140. *Reservation on the plains.*—With the progress of conservation the demand for fuel and small timber expanded enormously, and in order to relieve the pressure on the ghat forests, a scheme for the development and reservation of treegrowth in the plains was taken up in 1871. The immediate object in view was to supply fuel to the South Indian Railway, the extension of which to the Tinnevelly district was then under contemplation. A start was made with five blocks of waste land near Palamcottah. The scheme of plantation failed owing principally to a lack of knowledge of the silviculture and technique of planting of the indigenous species tried. The project was therefore abandoned.

141. *Tank-beds.*—Attention was next concentrated on the various tank-beds scattered over the division, where the natural growth of *Acacia arabica*, *Prosopis spicigera* and *Acacia planifrons* was attempted to be fostered and extended. The revenue and forest authorities from the beginning disagreed over the management of these reserves, particularly in regard to the restriction the latter wished to enforce as to the rights of villagers to fell timber for agricultural implements, and to graze their cattle. The protection of the reserves, some 18,500 acres in extent in 1,876 was therfore never complete. The tank-beds were divided into five circles and placed in charge of a Sub-Assistant Conservator Mr. Lowry but this was found too expensive and he was soon replaced by a Forest Ranger. The reserves never paid their way as is revealed by the following figures :—

	Revenue.	Eexpenditure.
	RS.	RS.
1871–1881	15,534	21,511

As a result of the difference of opinion between the forest and revenue authorities referred to above, the reserves were constantly shifted about from forest management to that of 'jungle conservancy' with the result, as Captain Beddome states that "cattle were allowed to graze indiscriminately and it was found impossible even to exclude goats."

The Conservator accordingly proposed in 1878 that these reserves should be transferred to the Revenue or Public Works Departments directly the expenditure on them was recouped. In 1881–82 all these reserves were transferred to the Revenue Department in accordance with G.O. No. 112, dated 27th January 1882 and a sum of Rs. 1,597–11–2

being the amount spent in excess of receipts, was transferred from the Jungle Conservancy Fund to the credit of the Forest Department. During the following years these reserves which were unsurveyed, but were estimated to amount to some 18,000 acres scattered throughout the division, were worked by the Tahsildar assisted by the old forest subordinate staff and the village officials. In G.O. No. 719, Revenue, dated 25th July 1887, it was ordered that as Government were of opinion, that the forest growth on tank-beds, should not be placed at the unfettered discretion of village officials, the management of such areas should be exercised through the Forest Branch of the Collector's office "where the interests involved required a more detailed supervision than could be exercised by the ordinary revenue establishment," but that the Forest Officer should not interfere where the trees on tank-beds were few in number.

142. *Revenue from tank-beds.*—Meanwhile, owing largely to the fact that the annual exploitation was considerably in excess of the annual possibility of the forest as determined on the principle of a sustained yield, the revenue from this source that is, babul in tank-beds, had increased enormously. The figures for the period 1885–86 to 1895–96 are given below :—

Year.	From trees.	From pods.
	RS.	RS.
1885–86	5,374	3,236
1886–87	4,372	4,211
1887–88	5,945	4,577
1888–89	12,607	2,714
1889–90	5,556	4,375
1890–91	18,631	4,012
1891–92	18,092	2,354
1892–93	17,551	2,375
1893–94	19,841	99
1894–95	14,382	4,336
1895–96	2,402	6,094
Total ...	1,24,853	38,363

Thus a total revenue of Rs. 1,63,216 had been collected during a period of 11 years—an annual yield of Rs. 15,000 approximately. Under G.O. No. 260, Revenue, dated 2nd March 1885, it was ordered that all revenue derived from tank-beds, after the legitimate wants of the villagers had been met, was to be credited to "Forests" and not to "Land Revenue". The claim set up by the Forest Department to the trees in tank-beds was thus indirectly recognized.

143. *Defects of the system of management.*—The dual control of the tank-beds, the direction being by the Forest Officer and the execution by the revenue establishment, proved most unsatisfactory. In 1887, Mr. Brasier, the District Forest Officer, issued the following regulations for the management of these areas :—

(*a*) The fellings should be conducted over a portion of a tank, if it was a large one, with many trees, but over the whole tank if small.

(*b*) About 25 of the *soundest* trees should be retained per acre as seed bearers such trees being marked and numbered serially.

(*c*) The other trees in the area above one foot girth at breast-height should also be counted and marked at the base so as to distinguish stumps sanctioned for sale when the trees were felled.

(*d*) The list of trees for sale and an estimate of the yield in cart-loads should be submitted with the sale list for confirmation.

(*e*) All areas felled over should be rigidly closed to grazing. (The period of closure was not specified.)

(*f*) An area was to be considered ripe for felling if the majority of the trees were over six years old.

No definite scheme was prepared on the lines suggested by Mr. Brasier and supervisors were left largely to their own devices. The attempts at excluding cattle were desultory and were soon abandoned, as the Tahsildars complained to the Collector that forest officials were interfering with the immemorial rights and privileges of the people. The rights of posterity do not appear to have been considered concurrently.

In 1896, the whole question of the management of these tank-beds was reconsidered in all its aspects. It was realized that unless they were constituted as "Reserved" forests, the forest officer would have no power to prohibit grazing when necessary. Since nearly all of them were below a square mile in extent and scattered all over the division, it seemed inadvisable from the point of view of supervision and expense, to reserve them. Mr. Hooper, Conservator of Forests, proposed that in view of the large revenue obtained from this source, the tank-beds should be protected by the grouping of them into working circles and the preparation of simple plans for their future management. This was all the more necessary as he considered that the areas had been overfelled in the past. The responsibility imposed on the eight supervisors, one for each taluk in controlling the work of the village officials and collecting the revenue was wholly disproportionate to the salary they drew Rs. 20 per mensem. Besides the District Forest Officer there was no one to supervise their work, and the necessity for corresponding with each of these officers direct, unnecessarily increased the office work in the District Forest Office. Mr. Hooper accordingly suggested that a special officer be deputed for the preparation of working schemes for all the tank-beds, and that their future management be vested in the Tahsildar under the control of the District Forest Officer. In Board's Proceedings Forest No. 375, dated 15th August 1896, the Board of Revenue stated that it was unable to support the proposal for reservation as it believed that "prohibition of the reservation of small scattered areas in the midst of cultivated land was specially called for in the case of tank-beds, in which free grazing was a highly valued privilege, and where excessive babul growth was injurious to the tanks as sources of irrigation". The Board while admitting that gradual degradation of tree growth was to be expected in tracts which received no greater protection than that afforded by section 26 of the Forest Act, were of opinion that babul growth on tank-beds was the one possible exception, as the species was unusually hardy and conditions for reproduction from seed exceptionally favourable. As regards the hardship to the villagers that was likely to result from the loss of babul by gradual degradation, it was observed that if the supply of fuel to the railway and factories from tank-beds, was strictly limited to the *surplus* produce there would remain an ample stock from which to meet the villagers' requirements for years to come. When this was found no longer to be the case, the question of reservation was ordered to be raised again, if such a step was considered advisable.

144. *The present position.*—The management of tank-beds thus still remains in the hands of the revenue authorities and from the fact that the average annual revenue has sunk to a little over Rs. 1,000 it may be deduced how successful the system of management has been in conserving this important fuel resource of the plains. The District Forest Officer is still consulted, on rare occasions on professional matters, but as he never inspects the areas he has little opportunity of knowing whether his advice has been carried out. The tank-beds not being reserved forests do not come under the purview of this plan but a detailed examination of the present state of affairs with a view to remedy matters, if possible, is advocated. Fuel is a produce which cannot on the score of expense bear transport by rail for long distances, and in the interests of providing the ryot of the plains with a cheap supply of fuel, and also with the object of fostering industries relying on cheap fuel for power, such an examination would be of value. Besides with the increasing pressure of population the area under regular cultivation is bound to increase. It will therefore be found ultimately necessary to increase the productive capacity of tank-beds by raising fuel and small timber on them, with a view to releasing land at present covered with sparse scrub jungle for cultivation.

(*e*) *The Forest Committee* (1878–82).

145. *Village forests.*—In the ghat forests the old system of allowing ryots to help themselves to small timber and fuel, and to graze their cattle in all areas under "conservancy" free of charge was still in force; the permission of the Tahsildar was theoretically at least necessary. Illicit fellings however continued, as in the absence of any definite law on the subject, prosecutions very seldom secured convictions. In the Tenkasi taluk, Mr. Puckle when conducting the settlement, had marked off by a clearly cut ride—the so-called "cairns line" of the present day—the lower slopes, which he intended should serve as "village forests". All the area below the line was considered communal forest and open to free felling and grazing. Above the ride, free removals were prohibited, grazing excluded and fire kept out; in fact the area was a reserved forest. The latter tract showed such a marked improvement that the change for the better was easily noticeable and was commented on even by the ryots of the division. This scheme of separation of "communal" and reserved forests received the warm support of Government, but was not extended to the other taluks of the division immediately.

Subject.	Date of letter.	Number and Date of Consultation.		Number of General Letter to England.	Page.
PRESIDENT AND GOVERNOR THE MOST NOBLE THE MARQUIS OF TWEEDDALE—*cont.*					
Minute by—. Has no objection to the proposed call upon Mr. Dalrymple, who should be required to give the fullest information in his power, as to the chief movers in creating the excitement under question.	4th. November 1847.	5	7th. December 1847.	Letter to the Honble. Court No. 3 of 1847.	335
Minutes by—. As the Honorable Mr. Chamier has not passed the Draft order calling upon Mr. Dalrymple for an explanation, states that he cannot be a party to seeking only partial information which would only mislead the controlling authorities. (*Vide* No. 7 UNDER COUNCILLORS.)	16th. November 1847.	6	7th. December 1847.	Do. No. 9.	336
Minute by—. Repeats his resolution not to be a party to partial or incomplete information being called for. (*Vide* No. 9 UNDER COUNCILLORS.)	22d. November 1847.	8	Do.	Do. No. 11.	338
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R					
S					
SOLICITOR—THE HONORABLE COMPANY'S.					
From—. Respecting Mr. Mellers purchase of a House & ground at Bellary.	23d. December 1846.	1	9th. February 1847.	Poll. Ry. G.L. to Engd. No. 9 of 1847. No. 10 & 11.	8
Order thereon.	....	2	Do.	....	44
From—. With reference to Extract from Minutes of Consultation dated the 9th. Instant states that he has made the required modifications in the proposed Lease of the premises at Bellary purchased by Mr. Mellor. Desires reference to the 3d. Para of his letter dated 12th. May 1846 for the points to be attended to previously to and regarding the Executions of the lease.	12th. April 1847.	1	20th. April 1847.	....	78
Resolution thereon.	....	2	20th. April 1847.	....	79
T					
TINNEVELLY.					
To R. D. Parker Esqr. late Acting Collector of—. Requesting him to report the state of the District of Tinnevelly, when he relinquished charge and whether it was then & had been for any time quiet and free from all disturbances.	16th. July 1847	4	20th. July 1847	Letter to Hon. Court No. 2 of 1847. No. 6.	244

Subject.	Date of letter.	Number and Date of Consultation.		Number of General Letter to England.	Page.
TINNEVELLY—*cont.*					
From the late Acting Collector of —. Reporting on the state of the Tinnevelly District when he relinquished charge and for some time previously. (*Vide* No. 6 UNDER PRESIDENT AND GOVERNOR.)	21st. July 1847	5	10th. August 1847.	Letter to the Hon. Court No. 2 of 1847. No. 8.	266

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